SD-TR-85-29

INSTALLATION RESTORATION PROGRAM
PHASE I: RECORDS SEARCH
LOS ANGELES AIR FORCE STATION, CALIFORNIA

FINAL REPORT

PREPARED FOR
DEPARTMENT OF THE AIR FORCE
HQ SPACE DIVISION (DEV)
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An Installation Restoration Program Phase I Records Search was conducted of Los Angeles Air Force Station from Jan. 21 to Jan. 25, 1985. Past and current employees were interviewed, records were reviewed, regulatory agencies were contacted, and a ground reconnaissance was conducted. Past waste handling and disposal practices were evaluated, and five past waste disposal or spill sites were identified. The sites were evaluated for potential for contamination and migration of contaminants using a decision tree process. Three sites

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PREFACE

The Installation Restoration Program Phase I: Records Search, Los Angeles Air Force Station, California was prepared by Environmental Science and Engineering, Inc., Gainesville, Florida.

It describes the installation missions, environment including geology and hydrology, findings of the records search for past hazardous material disposal sites, conclusions and recommendations. It will be used to identify and control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from past disposal practices.

This work was initiated in September, 1984 and was completed in July, 1985. Mr. John R. Edwards, Headquarters Space Division was the Project Manager.

This report has been reviewed by the office of Public Affairs (PA) and is releasable to the National Technical Information Service (NTIS). At the NTIS, it will be available to the general public, including foreign nations.

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INSTALLATION RESTORATION PROGRAM

PHASE I: RECORDS SEARCH

LOS ANGELES AIR FORCE STATION, CALIFORNIA

Prepared for:

UNITED STATES AIR FORCE
HQ SD/DEV
Los Angeles AFB, California

Submitted by:

ENVIRONMENTAL SCIENCE AND ENGINEERING, INC.
Gainesville, Florida

July 1985

TABLE OF CONTENTS

TABLE OF CONTENTS
(Continued, Page 2 of 2)

LIST OF TABLES

LIST OF TABLES
(Continued, Page 2 of 2)

LIST OF FIGURES

LIST OF FIGURES
(Continued, Page 2 of 2)

EXECUTIVE SUMMARY

INTRODUCTION

The Department of Defense (DOD) has developed a program to identify and evaluate past hazardous material disposal sites on DOD property, to control the migration of hazardous contaminants, and to control hazards to health or welfare that may result from these past disposal operations. This program is known as the Installation Restoration Program (IRP) and consists of four phases: Phase I--Initial Assessment/ Records Search, Phase II--Confirmation and Quantification, Phase III--Technology Base Development, and Phase IV--Operations/Remedial Actions. Environmental Science and Engineering (ESE), Inc. conducted the Phase I study of Los Angeles Air Force Station (LAAFS) with funds provided by the Air Force Systems Command (AFSC). This volume contains the Initial Assessment/Records Search of LAAFS. The Phase I assessments of Fort MacArthur and Sunnyvale Air Force Station are presented in separate documents.

INSTALLATION DESCRIPTION

LAAFS is situated on 95 acres in the City of El Segundo, within the metropolitan Los Angeles area of southern California. The station consists of two parcels (Areas A and B) of land at the intersection of Aviation and El Segundo Blvds.

LAAFS evolved from the site of the Western Development Division (WDD) of the Air Research and Development Command established in July 1954 in Inglewood, Calif. WDD was responsible for developing the nation's first intercontinental ballistic missile, the Atlas. In 1955, Space Technology Laboratories (STL) of Ramo-Wooldridge Corp. (the primary contractor at WDD) purchased 41.45 acres at the southeast corner of Aviation Blvd. and El Segundo Blvd. and constructed a research and development (R&D) center (now known as Area A). The Air Force purchased the R&D Center (Area A) from STL in December 1960. In June 1962, the

Air Force acquired a permit to use four buildings in the Navy-owned Douglas St. site (now Area B). These facilities and 52.28 acres (Area B) were transferred from the Navy to the Air Force in October 1963. The R&D Center (Area A) was redesignated LAAFS in April 1964. In March 1968, 1.42 acres at the Douglas St. site (Area B) were transferred from the Navy to the Air Force, increasing Area B property to 53.7 acres. LAAFS became the headquarters of the Space Division in October 1979. The mission of LAAFS is to provide administrative, facility, logistic, transportation, and medical support for all organizations and personnel assigned or attached to the installation. The Space Division is responsible for the research, development, procurement, production, test, and delivery of most DOD space systems.

ENVIRONMENTAL SETTING

LAAFS is situated in a developed area of Los Angeles dominated by aerospace industries. A residential housing development is situated immediately south of Area A. Due to their small size, Areas A and B are dominated by buildings, with all open areas essentially used as asphalt-paved vehicle parking. The small amount of natural soils exposed on the installation is used for ornamental landscaping. Both parcels of land are relatively flat, with surface elevations ranging from 92 to 98 ft above mean sea level (MSL).

Stormwater runoff is collected in open catch basins and routed through a system of vitrified clay, cast iron, or reinforced concrete pipes to the Los Angeles County Flood Control District storm drainage system. Due to the extensive paved areas on the station, all rainfall (minus evaporation) leaves the installation in the form of stormwater runoff. Little infiltration of rainfall is expected to occur on the station.

The climate of the area is mild, with temperatures moderated by the Pacific Ocean. The average monthly temperature ranges from a low of 56.0°F in January to a high of 70.3°F in August. The annual average rainfall is 12.08 inches, 87 percent of which occurs in the winter

months (November through March). Net precipitation is -33.92 inches per year, and the 1-year, 24-hour rainfall event is 3 inches. The low value for net precipitation indicates a low potential for significant infiltration or the formation of permanent surface water features. The 1-year, 24-hour rainfall event of 3 inches indicates a moderate potential for runoff and erosion. The majority of the installation, however, is asphalt-paved and contains stormwater drainage systems to control runoff, thus eliminating any significant potential for flooding and soil erosion.

The near-surface soils on LAAFS are clayey, silty sands with predominantly silty, fine sands below about 10 ft. Due to the large amount of paved areas, most surface infiltration is restricted because surface drainage enters the storm sewer system.

Ground water occurrences can be divided into four general classes, depending on the formation in which the aquifer occurs. The Monterey and Pico Formations contain connate ground water with high salinity, therefore eliminating the units as a potable water aquifer. The overlying San Pedro Formation contains two productive potable aquifer systems, the Silverado and Lynwood Aquifers. The third formation containing potable ground water is the Lakewood Formation. This formation consists of two productive systems termed the Gage and Gardena Aquifers. The shallowest ground water occurrence is found as a localized semiperched system in the basal section of the older dune sand. Depth to this uppermost ground water is approximately 50 ft in the vicinity of LAAFS. Due to limited quantities, the shallow ground water is not used as a potable, industrial, or municipal source. The deeper aquifers are separated from the shallow, semiperched aquifer by aquicludes.

As a result of the urban setting and associated lack of available habitat, few wildlife species occur on LAAFS. Various urban bird species likely forage in the trees on Area A, and common rodents (e.g., mice) would be expected to occur onbase. No threatened or endangered species are present.

METHODOLOGY

During the course of the Phase I investigation of LAAFS, interviews were conducted with base personnel (past and current) familiar with past waste disposal practices; file searches were performed for past hazardous waste activities; interviews were held with local, state, and Federal agencies; and ground reconnaissance inspections were conducted at past hazardous waste activity sites.

The review of past operation and maintenance functions and past waste management practices at LAAFS resulted in the identification of five sites that were initially considered areas of concern, with potential for contamination.

FINDINGS AND CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is a potential for environmental contamination resulting from past waste disposal practices and to assess the potential for contaminant migration from these sites.

Five sites were identified at LAAFS as having potential for environmental contamination. These sites, dates of operation or occurrence, and the evaluations of the sites are summarized in Table 1. Site locations are shown in Fig. 1. Two sites (Nos. 4 and 5) are stormwater drainage disposal sites that have little potential for contamination. One site (No. 5) is an operating stormwater drainage disposal site that may require an industrial discharge permit; therefore, this site was determined to warrant review under the Base Environmental Program. Site No. 3 was a former neutralization basin that may contain residual contamination but has no potential for migration; this site was referred to the Base Environmental Program for investigation.

Two sites (Nos. 1 and 2) were identified as potentially containing hazardous contaminants resulting from past activities. These sites have

Table 1. Summary of Potential Contamination Sites on LAAFS

Site No.*	Site Description	Report Designation	Date of Operation or Occurrence	Waste Description	Conclusion
1	Underground Fuel Spill Site	FS-1	1977	25,800 gal of No. 2 Fuel Oil	Potential for residual contamination and contaminant migration. Received HARM score of 60. Phase II studies recommended.
2	Pesticide Disposal Site	DS-1	1960-1975	Pesticide-contaminated wastewater	Potential for residual contamination and contaminant migration. Received HARM score of 59. Phase II studies recommended.
3	Bldg. 130, Plating Shop Neutralization Basin	SD-1	1957-1960	Plating shop wastewater containing copper, cadmium, cyanide, nickel, iridite, and acid and alkaline solutions	Potential for residual contamination. Refer to Base Environmental Program for sampling. No HARM rating. No Phase II studies recommended.
4	Bldg. 244, Stormwater Drainage Disposal Site	SD-2	1982-1985	Small quantities of outdated pesticide formulations from the BX	No potential for residual contamination. Disposal practice ceased. No HARM rating. No Phase II studies recommended.
5	Bldg. 219, Stormwater Drainage Disposal Site	SD-3	1963-Present	Vehicle wash wastewater containing detergent surfactants, oil, and grease	No potential for residual contamination. Refer to Base Environmental Program for review of operation. No HARM rating. No Phase II studies recommended.

*See Figs. 1 and 2 for site locations.

Source: ESE, 1985.

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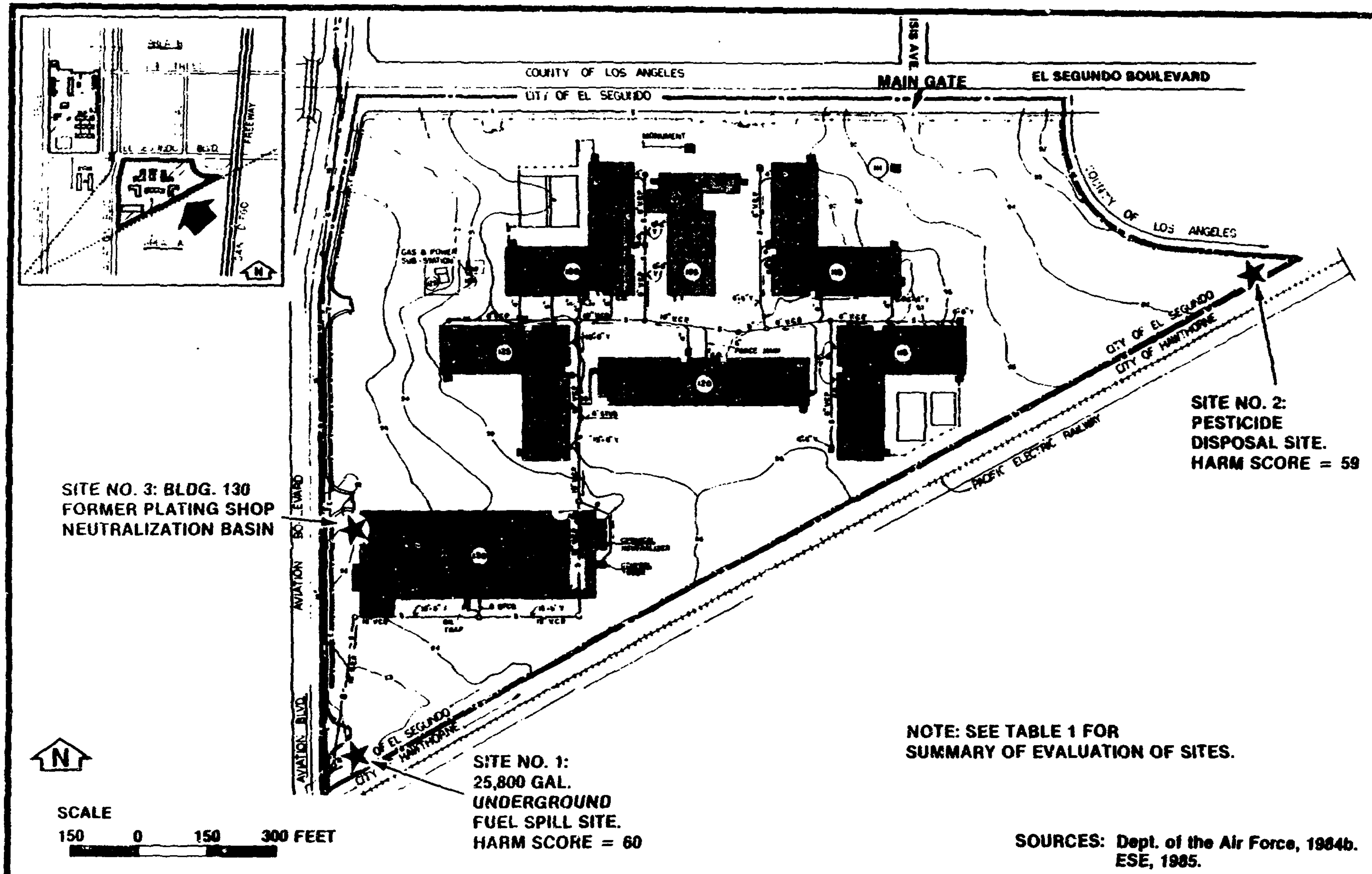

Figure 1
MAP OF AREA A SHOWING POTENTIAL CONTAMINATION SITES

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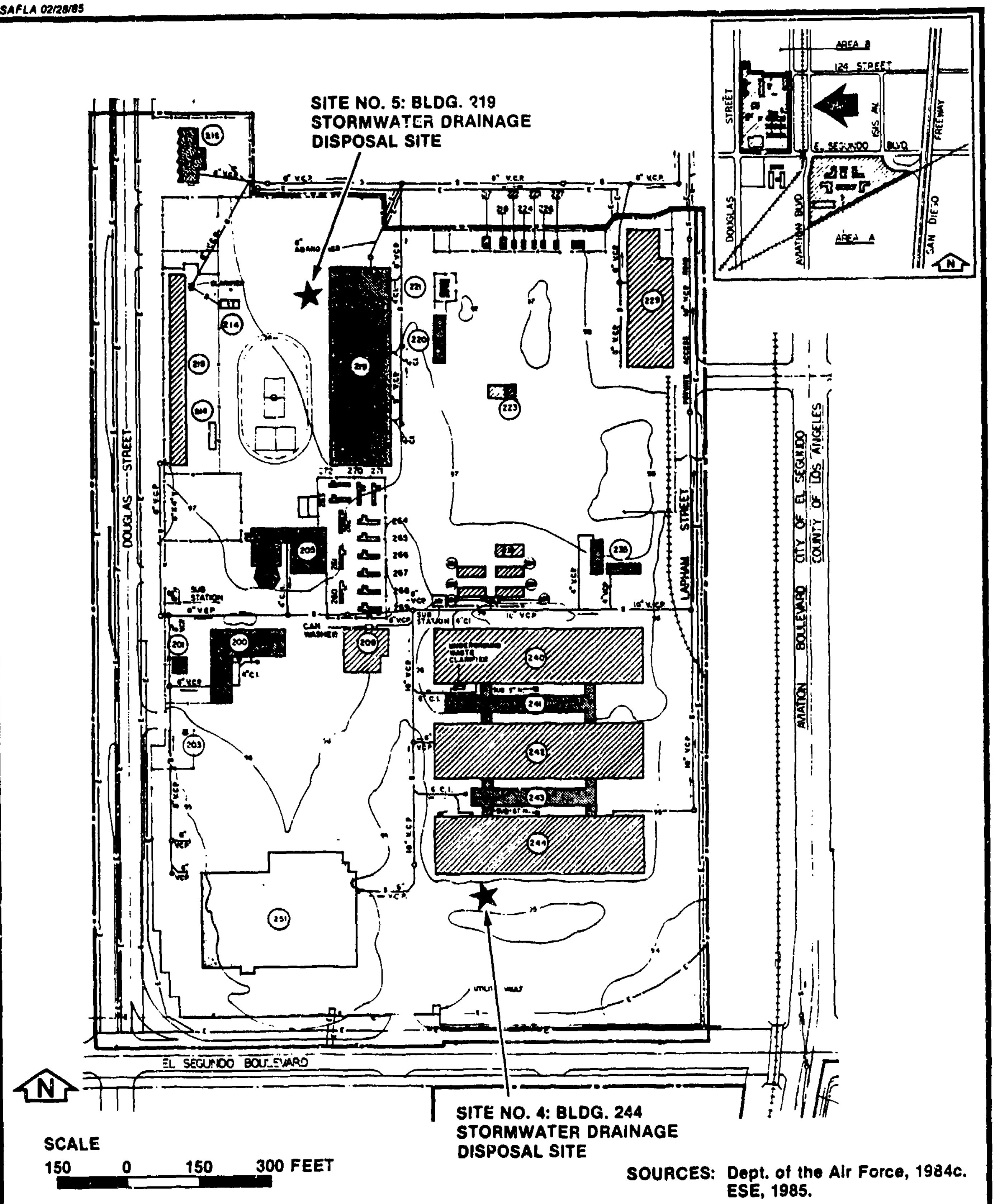


Figure 2
MAP OF AREA B SHOWING
POTENTIAL CONTAMINATION SITES

INSTALLATION
RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

a potential for contaminant migration and have been assessed using the Hazard Assessment Rating Methodology (HARM), in which factors such as site characteristics, waste characteristics, potential for contaminant migration, and waste management practices are considered. The details of the rating procedure are presented in App. G. The HARM system is designed to indicate the relative need for followup action (Phase II).

RECOMMENDATIONS

Site Nos. 1 and 2 have a potential for residual contamination and contaminant migration; therefore, Phase II actions are recommended for these sites. The recommended actions are intended to be used as a guide in the development and implementation of the Phase II study. The detailed recommendations developed for further assessment of Site Nos. 1 and 2 are presented in Sec. 6.0. These recommendations are summarized as follows:

Site No. 1:	Underground Fuel Spill Site	Install two downgradient and one upgradient monitor wells in the shallow, unconfined aquifer. Monitor for petroleum hydrocarbons and the parameters listed in Table 6.0-2. During well installation, analyze soils for petroleum hydrocarbons as a function of depth.
Site No. 2:	Pesticide Disposal Site	Sample soils to a depth of 18 to 24 inches. Analyze for pesticides and arsenic, lead, copper, and mercury.

The operating stormwater drainage disposal site (Site No. 5) needs to be reviewed by the Base Environmental Program, and operational modifications should be made in accordance with state and federal regulations. The former neutralization basin (Site No. 3) needs to be investigated by the Base Environmental Program. Residual sludges (if any) in this basin should be sampled and analyzed for trace metals (including copper, cadmium, and nickel) and cyanide and the sludges disposed of appropriately.

1.0 INTRODUCTION

1.1 BACKGROUND

Due to its primary mission, the U.S. Air Force (USAF) has long been engaged in operations dealing with toxic and hazardous materials. Federal, state, and local governments have developed strict regulations to require that disposers identify the locations and contents of disposal sites and take action to eliminate the hazards in an environmentally responsible manner. The primary Federal legislation governing disposal of hazardous waste is the Resource Conservation and Recovery Act (RCRA) of 1976, as amended. Under Sec. 6003 of the Act, Federal agencies are directed to assist the U.S. Environmental Protection Agency (EPA), and under Sec. 3012, state agencies are required to inventory past disposal sites and make the information available to the requesting agencies. To assure compliance with these hazardous waste regulations, the Department of Defense (DOD) developed the Installation Restoration Program (IRP). The current DOD IRP policy is contained in Defense Environmental Quality Program Policy Memorandum (DEQPPM) 81-5, dated Dec. 11, 1981, and implemented by USAF message dated Jan. 21, 1982. DEQPPM 81-5 reissued and amplified all previous directives and memoranda on the IRP. DOD policy is to identify and fully evaluate suspected problems associated with past waste disposal practices and to control hazards to health and welfare that resulted from these past operations. The IRP will be the basis for response actions on USAF installations under the provisions of the Comprehensive Environmental Response, Compensation, and Liability Act (CERCLA) of 1980, as clarified by Executive Order 12316. CERCLA is the primary Federal legislation governing remedial action at the past hazardous waste disposal sites.

1.2 PURPOSE, AUTHORITY, AND SCOPE OF THE ASSESSMENT

The IRP has been developed as a 4-phase program, as follows:

Phase I--Initial Assessment/Records Search

Phase II--Confirmation and Quantification

Phase III--Technology Base Development

Phase IV--Operations/Remedial Actions

Environmental Science and Engineering, Inc. (ESE) conducted the records search at Los Angeles Air Force Station (LAAFS), with funds provided by the Air Force Systems Command (AFSC). This report contains a summary and evaluation of the information collected during Phase I of the IRP and recommendations for any necessary Phase II action.

The objective of Phase I was to identify the potential for environmental contamination from past waste disposal practices at LAAFS and to assess the potential for contaminant migration. Activities performed in the Phase I study included the following:

1. Review of site records;
2. Interviews with personnel familiar with past generation and disposal activities;
3. Inventory of wastes;
4. Determination of estimated quantities and locations of current and past hazardous waste treatment, storage, and disposal;
5. Definition of the environmental setting at the base;
6. Review of past disposal practices and methods;
7. Performance of field and aerial inspections;
8. Gathering of pertinent information from Federal, state, and local agencies;
9. Assessment of potential for contaminant migration; and
10. Development of conclusions and recommendations for any necessary Phase II action.

ESE performed the onsite portion of the records search during January 1985. The following team of professionals was involved:

- o Charles D. Hendry, Jr., Ph.D., Staff Chemist and Project Manager; Team Leader for the LAAFS, Fort MacArthur, and Sunnyvale AFS records searches; 11 years of professional experience.
- o Allen P. Hubbard, P.E., Engineer, 6 years of professional experience.
- o Jeffrey J. Kosik, Engineer, 3 years of professional experience.
- o Donald F. McNeill, Geologist, 3 years of professional experience.

Detailed information on these individuals is presented in App. B.

1.3 METHODOLOGY

The methodology utilized in the LAAFS records search began with a review of past and current industrial operations conducted at the base. Information was obtained from available records such as shop files and real property files, as well as interviews with past and current base employees from the various operating areas. Interviewees included current and former personnel associated with the mission of LAAFS and tenant organizations onbase. A list of interviewees, by position and approximate years of service, is presented in App. C.

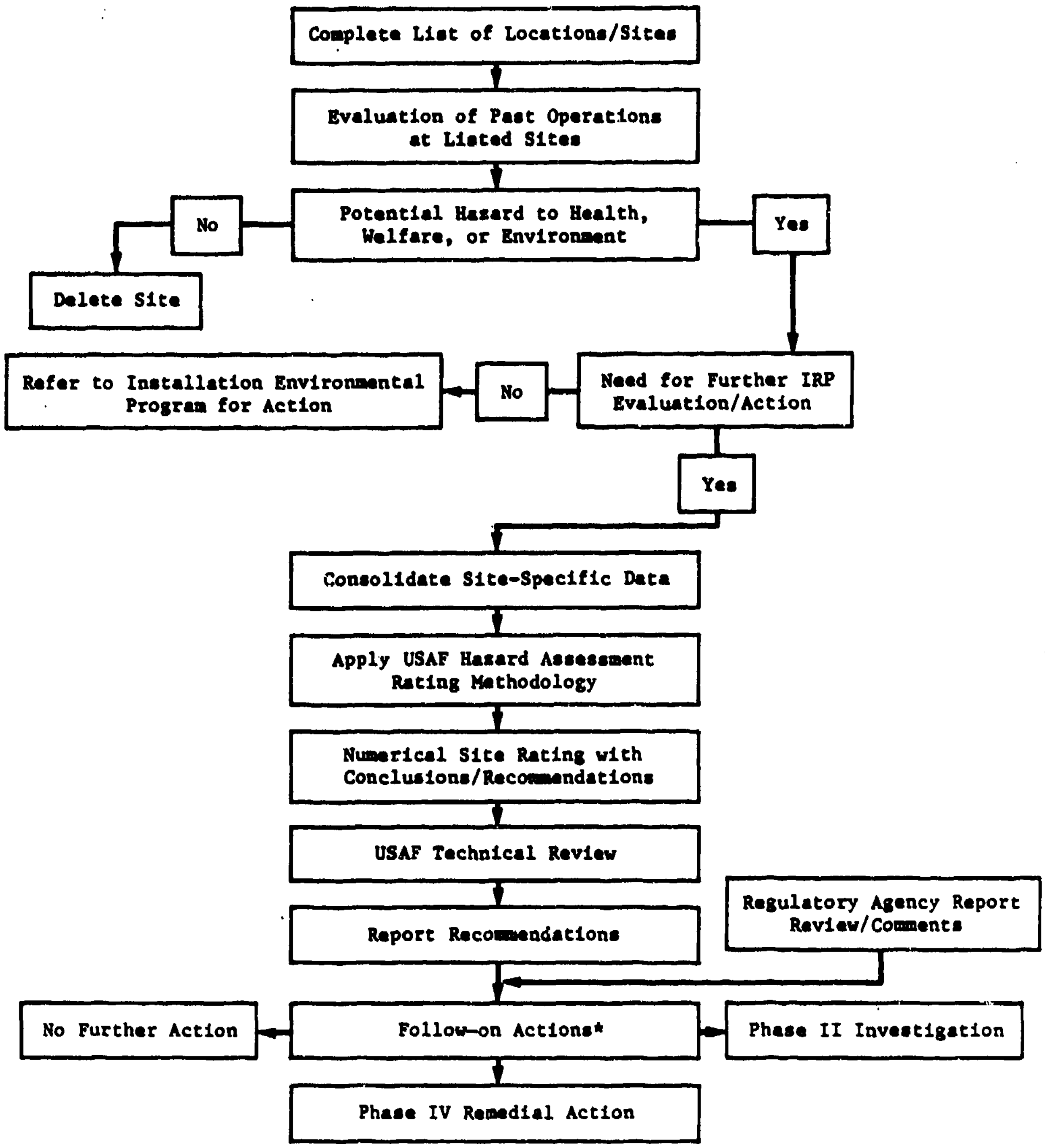
Concurrent with the base interviews, the applicable Federal, state, and local agencies were contacted for pertinent base-related environmental data. The outside records centers and agencies contacted and personnel interviewed are listed in App. C.

The next step in the activity review was to determine the past management practices regarding the use, storage, treatment, and disposal of hazardous materials from the various operations on the base. Included in this part of the activities review was the identification of all known past disposal sites and other possible sources of contamination such as spill areas.

A general ground tour of the identified sites was then made by the ESE Project Team to gather site-specific information including: (1) visual evidence of environmental stress, (2) the presence of drainage ditches and systems, and (3) visual inspection for any obvious signs of contamination or leachate migration. Due to the relatively small size of the installation, a helicopter overflight was not included as part of the onsite visit.

Using the process shown in Fig. 1.3-1, a decision was then made, based on all of the above information, regarding the potential for hazardous material contamination at any of the identified sites. If no potential existed, the site was deleted from further consideration. If potential for contamination was identified, the potential for migration of the contaminant was assessed based on site-specific conditions. If there were no further environmental concerns, the site was deleted. If the potential for contaminant migration was considered significant, the site was evaluated and prioritized using the Hazard Assessment Rating Methodology (HARM). A discussion of the HARM system is presented in App. H.

PHASE I INSTALLATION RESTORATION PROGRAM
RECORDS SEARCH FLOWCHART



*Beyond scope of Phase I.

SOURCES: HQ AFESC, 1983.
ESE, 1985.

Figure 1.3-1 **DECISION PROCESS**	**INSTALLATION RESTORATION PROGRAM** **LOS ANGELES AIR FORCE STATION**

2.0 INSTALLATION DESCRIPTION

2.1 LOCATION, SIZE, AND BOUNDARIES

LAAFS is situated in El Segundo, Calif., in Los Angeles County (see Fig. 2.1-1). The installation is comprised of two parcels--Area A and Area B--situated southeast and northwest, respectively, of the intersection of El Segundo Blvd. and Aviation Blvd. LAAFS supports a total base population of 4,359, consisting of 1,640 military personnel and 2,719 civilian employees, and occupies a total of approximately 95 acres surrounded by a mixture of residential and industrial areas. The acreage, status, and use of land occupied by LAAFS are listed in Table 2.1-1.

Area A occupies 41.45 acres containing the headquarters of the Space Division (SD), the base communication center, the Officers' Open Mess, and offices and laboratories used by tenants and the Aerospace Corp. (LAAFS, 1983). Area A is bounded by Aviation Blvd. on the west, El Segundo Blvd. on the north, Interstate 405 on the east, and a Pacific Electric Railway right-of-way on the south (see Fig. 2.1-2).

Area B is a 53.7-acre complex which houses most support functions at LAAFS, the NCO Open Mess, the USAF Clinic, and the commissary (LAAFS, 1983). Area B is bounded by Douglas St. on the west, El Segundo Blvd. on the south, and Aviation Blvd. on the east. The land adjacent to the northern boundary of Area B is used by Northrop Corp. (see Fig. 2.1-3).

The Fort MacArthur Military Family Housing Annex contains military family housing, administrative offices, warehouses, Civil Engineering shops, and a parade ground in support of LAAFS. The 96-acre annex is situated 20 road miles southeast of LAAFS in the city and county of Los Angeles and the community of San Pedro. The annex comprises the area of Fort MacArthur known as the Middle Reservation. (A records search of Fort MacArthur was performed by ESE and is documented separately.)

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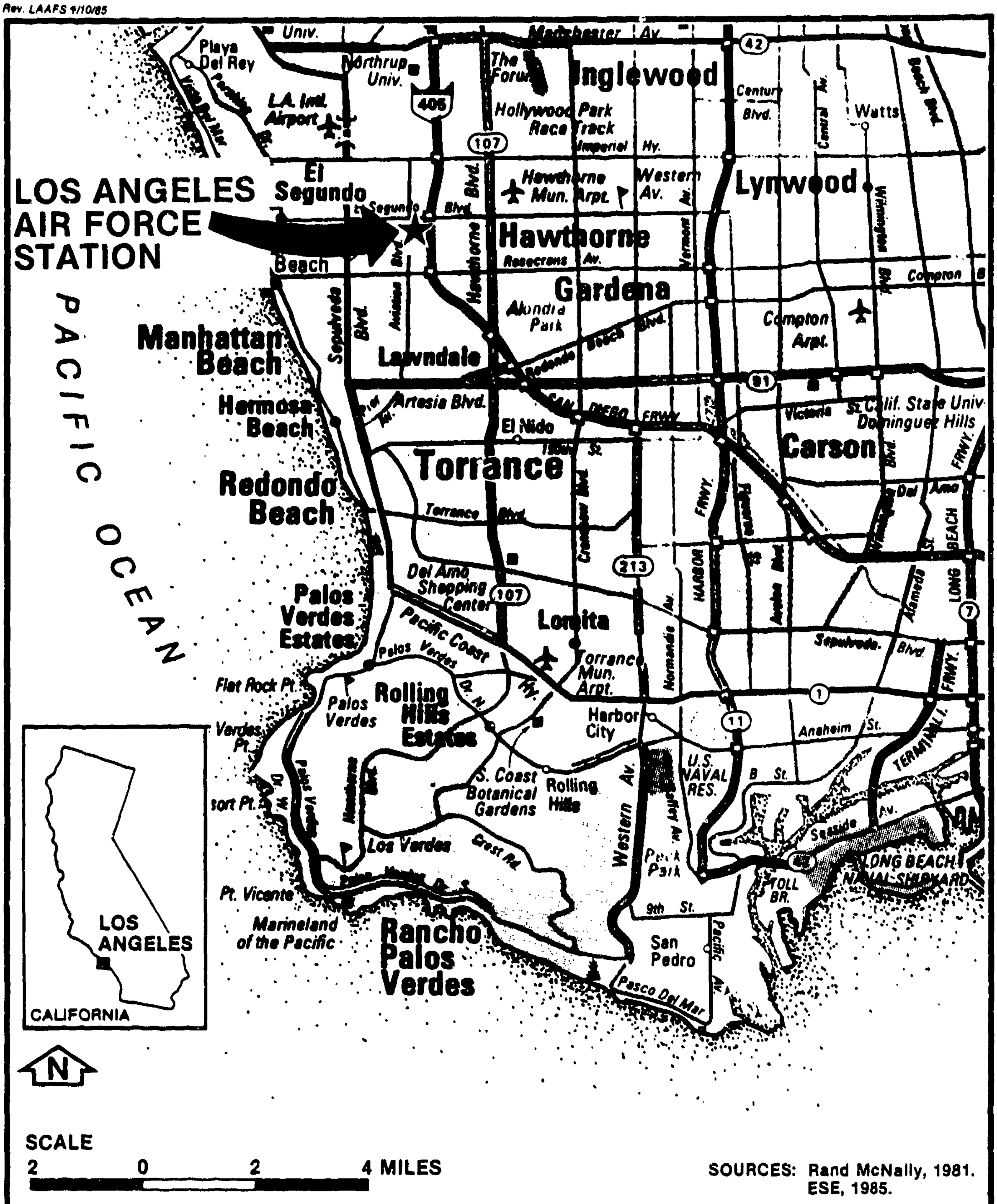


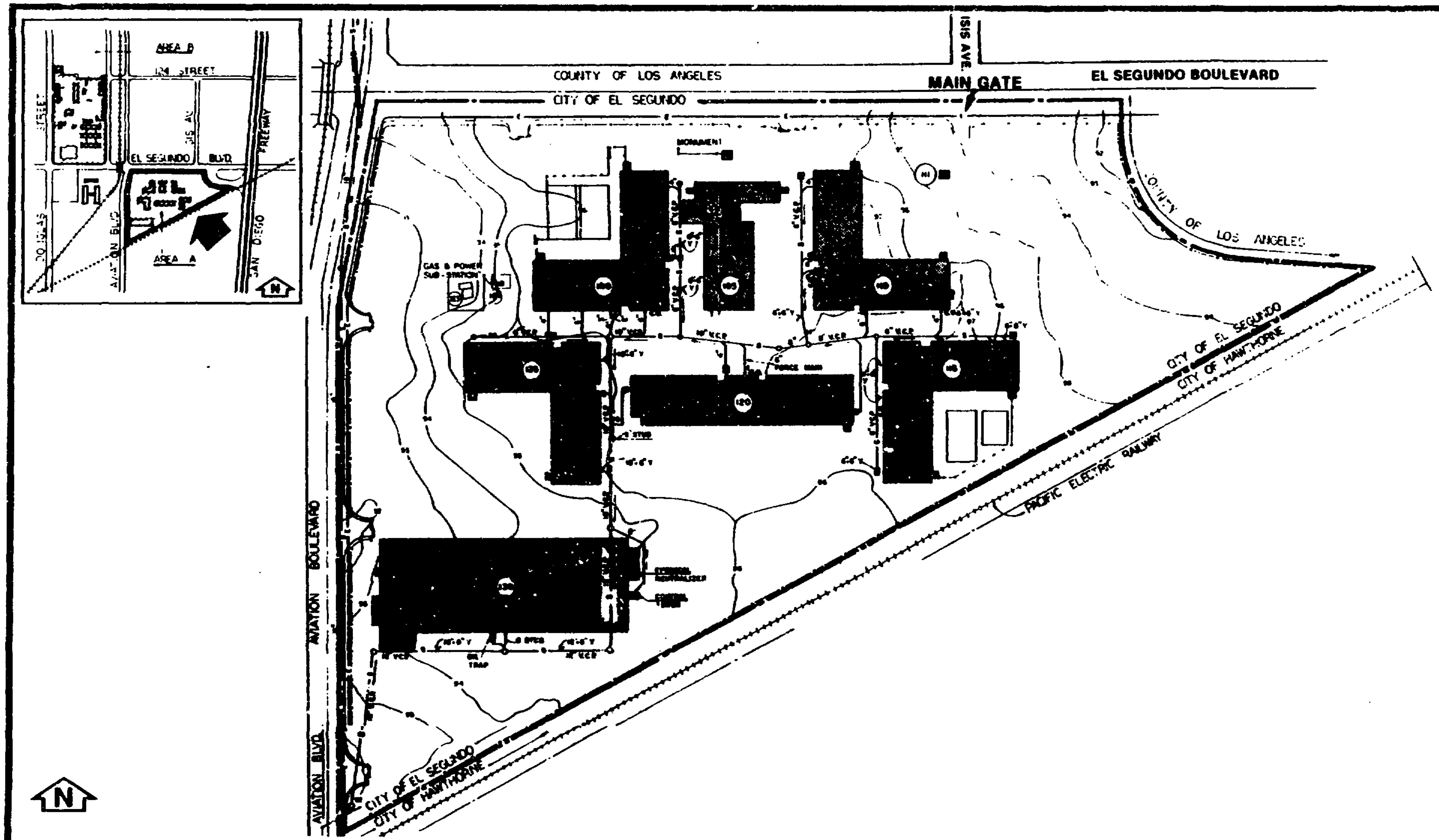
Figure 2.1-1
LOCATION MAP

INSTALLATION RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

Table 2.1-1. Property Under the Jurisdiction of LAAFS

Site	Acreage	Status	Use
Area A	41.45	Land fee purchase	Research and development offices and laboratories
Area B	53.70	Land fee purchase	Support equipment and personnel housing
Fort MacArthur Military Family Housing Annex	96.0	Land fee purchase (56 acres)	Housing, offices, warehouses, and Civil Engineering shops
		Withdrawn from public domain (40 acres)	Parade ground, officer's quarters, airmen dormitories, offices, Patten Quadrangle, and military family housing
Lawndale Annex	13.34	Permit to use from Dept. of Army	Research and development offices and laboratories

Sources: 6592d Air Base Group/DE, 1984.
LAAFS, 1983.
ESE, 1985.



SOURCES: Dept. of the Air Force, 1984b.
ESE, 1985.

Figure 2.1-2
MAP OF AREA A

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RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

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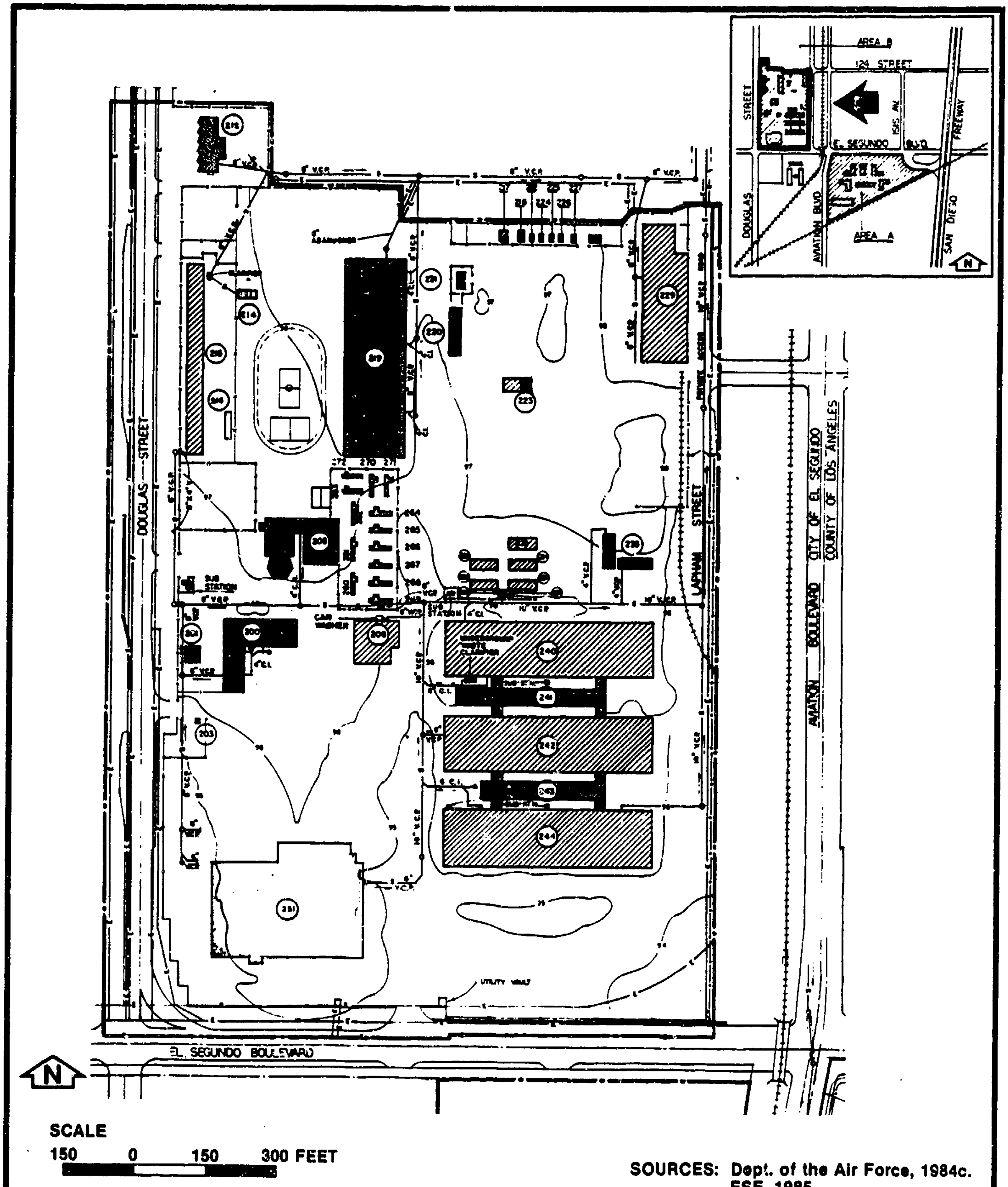


SOURCES: Dept. of the Air Force, 1984c.
ESE, 1985.

Figure 2.1-3
MAP OF AREA B

INSTALLATION RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

2.2 HISTORY

This section summarizes the history of LAAFS. During its history, a number of USAF organizational changes have occurred that affected the command structure of the installation. A brief chronology of these organizational changes is presented in Table 2.2-1; the following paragraphs provide additional details associated with these changes.

In July 1954, USAF established the Western Development Division (WDD) of the Air Research and Development Command (ARDC) in a former private school building in Inglewood, Calif. The new division was assigned responsibility for developing the nation's first intercontinental ballistic missile (ICBM), the Atlas. The Ramo-Wooldridge Corp. was the primary contractor (AFSC, 1980a).

In the fall of 1955, Space Technology Laboratories (STL) of Ramo-Wooldridge Corp. purchased 41.45 acres at the southeast corner of Aviation Blvd. and El Segundo Blvd. and constructed the facility now known as Area A (LAAFS, 1983).

By the end of 1955, WDD was assigned the additional task of developing an intermediate-range ballistic missile (IRBM), Thor. Also, WDD was responsible for achieving initial operating capability (IOC) with the missile systems it was building.

Management responsibility for Weapon System (WS) 117L, an advanced military satellite system, was transferred from Wright Air Development Center to WDD on Feb. 15, 1956. Lockheed Missile Systems Division was designated primary contractor for WS 117L and its upper-stage vehicle, Hustler (later redesignated Agena), on Oct. 29, 1956 (AFSC, 1980a).

The WDD was redesignated the Air Force Ballistic Missile Division (AFBMD) on June 1, 1957, and the first Thor IRBM was successfully launched from Cape Canaveral, Fla., on Sept. 20, 1957. In December, the first successful Atlas launch and short-range flight occurred.

Table 2.2-1. Chronology of Organizational Changes for LAAFS

Date	Organization	Comments
July 1, 1954	The Western Development Division (WDD) was constituted, activated, and assigned to the Air Research and Development Command (ARDC) and organized at Los Angeles (Inglewood), California.	
Fall, 1955		Space Technology Laboratories (STL) of Ramo-Wooldridge Corp. purchased 41.45 acres at the southeast corner of Aviation Blvd. and El Segundo Blvd.
June 1, 1957	The WDD was redesignated the Air Force Ballistic Missile Division (AFBMD), HQ ARDC, without change of station, effective 1 June 1957.	
June, 1960		Aerospace Corp. was formed as a nonprofit entity to replace STL and provide systems engineering and technical direction for space programs.
Dec., 1960		USAF purchased the R&D Center (now Area A) from STL for use by the Aerospace Corp.

Table 2.2-1. Chronology of Organizational Changes for LAAFS (Continued, Page 2 of 2)

Date	Organization	Comments
April 1, 1961	Deputy Commander Air Force Systems Command (AFSC) for Aerospace Systems (DCAS), constituted, activated, and assigned to AFSC, organized at Los Angeles.	Personnel reassigned from AFBMD to DCAS for concurrent re-assignment, as appropriate, to HQ Ballistic Systems Division (BSD) and HQ Space Systems Division (SSD).
Oct. 10, 1962	SSD and BSD reassigned from DCAS to AFSC.	
July 1, 1967	Space and Missile Systems Organization (SAMSO) constituted, activated, and organized at Los Angeles, and assigned to AFSC.	Assumed the functions of SSD and BSD.
Oct. 1, 1979	SAMSO redesignated as Space Division (SD).	Air Force realignment of space and missile systems research, development, and aquisition elements.

Source: AFSC, 1980a.

Using an ICBM, the Soviet Union placed Sputnik I, the world's first manmade satellite, into earth's orbit on Oct. 4, 1957, between the initial Thor and Atlas launches.

Within days of the Sputnik launch, an Air Force scientific advisory board, the Ad Hoc Committee on Advanced Weapons Technology and Environment, urged development of second-generation ballistic missiles for use as weapon systems and space boosters. High priorities were set for development of military satellite systems for communications, weather prediction, and other purposes. The committee recommended that AFBMD become a permanent organization for missile and space satellite projects (AFSC, 1980a). The Thor and Atlas missiles were recommended as basic satellite booster systems. The Thor and Atlas missiles eventually served as the framework for U.S. space programs through the late 1970s, using the Agena, Delta, Centaur, and Burner II upper-stage vehicles to support manned and unmanned space projects of the USAF and the National Aeronautics and Space Administration (NASA), which was created on Oct. 1, 1958.

To accelerate ballistic missile operational capability, in 1957 ballistic missile operational programs, IOC facilities, and planning were transferred from AFBMD to the Strategic Air Command (SAC) (AFSC, 1980a).

The Advanced Research Projects Agency (ARPA) was activated on Feb. 7, 1958, to manage all DOD space programs during research and development phases.

In June 1960, the Aerospace Corp. was formed as a nonprofit entity to replace STL and provide systems engineering and technical direction for future space programs (LAAFS, 1983).

On Oct. 31, 1960, Headquarters (HQ) USAF announced that the R&D complex at Los Angeles would be divided. The ballistic missile development team

moved to Norton AFB near San Bernardino, Calif., and was combined with the Air Material Command (AMC) missile site activation offices. The space programs remained at Los Angeles.

USAF purchased the R&D Center (now Area A) from STL in December 1960 for use by the Aerospace Corp.

On April 1, 1961, reorganization of the Air Force resulted in the formation of three new commands--the AFSC, Air Force Logistics Command, and Office of Aerospace Research--from the former ARDC and AMC. Former elements of ARDC and AMC were reorganized as the Space Systems Division (SSD) and the Ballistics Systems Division (BSD). The SSD was given responsibility for military space systems and boosters, and the BSD was to handle ballistic missile development and site activation. Both divisions were placed under the Deputy Commander of AFSC for Aerospace Systems in Los Angeles (AFSC, 1980a).

In June 1962, USAF acquired a permit to use four buildings in the Navy-owned Douglas St. site (now Area B). Facilities and 52.28 acres at this site were transferred from the Navy to USAF on Oct. 10, 1963 (LAAFS, 1983).

The R&D Center (Area A) was redesignated LAAFS and the headquarters of SSD in April 1964.

On July 1, 1967, BSD and SSD were inactivated, and the Space and Missile Systems Organization (SAMSO) of AFSC was activated. SAMSO assumed control of the SSD headquarters at LAAFS (AFSC, 1980a).

In March 1968, Bldg. 212 and 1.42 acres at the Douglas St. site (Area B) were transferred from the Navy to USAF, increasing LAAFS property at Area B to 53.7 acres.

SAMSO was inactivated on Oct. 1, 1979, and its personnel and resources were divided between the SD, with headquarters at LAAFS, and the Ballistic Missile Office, with headquarters at Norton AFB. The Space and Missile Test Organization (SAMTO) at Vandenberg AFB, Calif., and the Air Force Satellite Control Facility (AFSCF) at Sunnyvale AFS, Calif., were assigned to SD (AFSC, 1980a).

2.3 MISSION AND ORGANIZATION

The mission of LAAFS is to provide administrative, facility, logistic, transportation, and medical support for all organizations and personnel assigned or attached to the installation (LAAFS, 1983).

The SD is responsible for the research, development, procurement, production, test, and delivery of most DOD space systems (LAAFS, 1983).

The following organizations are assigned to LAAFS (AFSC, 1984b; LAAFS, 1983):

Primary Organizations

- Space Division
- 6592d Air Base Group (ABG)
- USAF Clinic

Tenants

- Aerospace Corp.
- Det. 27, 6592nd Management Engineering Squadron (MES)
- Air Force Audit Agency (AFAA)
- 2080th Communications Squadron
- Defense Communications Agency (DCA)
- Det. 13, 1369th Audio Visual Squadron (AVS)
- Navy Space Systems Activity (NSSA)
- Office of Special Investigation (OSI) Det. 1811
- SAC Systems Office
- HQ Air Force Test and Evaluation Center (AFTEC) Operating Location (OL) AC
- Defense Contract Audit Agency

Air Training Command Resident Office
Los Angeles (LA) Courier Station
Det. 50, 2nd Weather Squadron
North Atlantic Treaty Organization (NATO) Project Team
Defense Mapping Agency Aerospace Center
Defense Investigative Service
U.S. Army Corps of Engineers
Det. 3, Air Force Acquisition Logistics Deputate
Det. 12, Rocketdyne Division
Det. 15, Rockwell International Corp.
Det. 36, Hughes Aircraft
Det. 37, Northrop Corp.
Det. 46, TRW
Det. 47, Douglas Aircraft Co.
261st Combat Communications Squadron

Organizations, missions, and tenant activities are described in App. D.

3.0 ENVIRONMENTAL SETTING

This section describes the environmental conditions at LAAFS, including specific site data for meteorology, geology, soils, surface hydrology, geohydrology, and biota. These data subsequently are used in the HARM scoring system to numerically assess the pollutant transport mechanisms and potential receptors present at the site. App. G describes the factors used in the HARM system.

3.1 METEOROLOGY

Climatological data for LAAFS are summarized in Table 3.1-1. These data were collected at the National Weather Service meteorological station at Los Angeles International Airport, which is located approximately 2 miles north of LAAFS. The period of record for the data is 29 years (1951 to 1980).

The climate of the Los Angeles area is mild with temperatures moderated by the Pacific Ocean. The average monthly temperature ranges from a low of 56.0°F in January to a high in August of 70.3°F. The annual average temperature is 62.6°F.

Based on the data in Table 3.1-1, the annual average rainfall for the area is 12.08 inches, 87 percent of which occurs in the winter months (November through March) at the rate of approximately 2.1 inches per month. In contrast, the summer (April to October) is dry, with rainfall rates ranging from 0.01 to 0.93 inch per month.

The pathways category of the HARM scoring system includes surface water migration, flooding, and ground water migration routes. Numerical evaluation of these routes involves factors associated with the particular migration route (see App. G). Two meteorological factors used in this evaluation are net precipitation and the 1-year, 24-hour rainfall event. Mean annual evaporation for Los Angeles is 46 inches

Table 3.1-1. Climatological Data for Los Angeles Air Force Station

Month	Temperature (°F)	Precipitation (inches)
January	56.0	3.06
February	57.1	2.49
March	57.4	1.76
April	59.5	0.93
May	62.4	0.14
June	65.6	0.04
July	69.0	0.01
August	70.3	0.10
September	69.5	0.15
October	66.3	0.26
November	61.2	1.52
December	57.0	1.62
Annual	62.6	12.08
Period of Record	1951-1980	1951-1980

NOTE: Data are for Los Angeles Airport, Calif.; Station Index No. 5114; Los Angeles Co.; 33°56'N 118°23'W; Elevation = 100 ft above mean sea level (MSL).

Sources: National Climatic Data Center, 1983.
ESE, 1985.

per year (U.S. Dept. of Commerce, 1968); therefore, net precipitation, which is the difference between annual precipitation and evaporation, is -33.92 inches per year. The 1-year, 24-hour rainfall event is 3 inches (U.S. Dept. of Commerce, 1961). The low value for net precipitation indicates a low potential for significant infiltration or the formation of permanent surface water features. The 1-year, 24-hour rainfall event of 3 inches indicates a moderate potential for runoff and erosion. The majority of the installation, however, is asphalt-paved and contains stormwater drainage systems to control runoff, thus eliminating any significant potential for flooding and soil erosion.

3.2 GEOGRAPHY

3.2.1 PHYSIOGRAPHY

LAAFS is located in a developed area of Los Angeles dominated by aerospace industries. A residential housing development is situated immediately south of area A across the Pacific Electric Railway right-of-way. Due to their small size, Areas A and B are dominated by buildings, with all open areas essentially used as asphalt-paved vehicle parking. The small amount of natural soils exposed on the installation is used for ornamental landscaping.

Both parcels of land are relatively flat. Surface elevations on Area A range from 97 ft above MSL near Bldg. 105 in the center of the station to 92 ft above MSL at both the northeastern corner and along the western edge of the station. The center of Area A forms a small topographic divide with a gradient of approximately -1 ft per 100 ft toward the northeast and west (Dept. of the Air Force, 1984b).

Surface elevations on Area B range from 98 ft above MSL in the northern portion near Bldg. 219 to 94 ft above MSL along El Segundo Blvd. at the southern edge of the parcel. The topographic gradient is approximately -1 ft per 300 ft from north to south on Area B (Dept. of the Air Force, 1984b).

3.2.2 SURFACE HYDROLOGY

Stormwater drainage on Area A consists of an aboveground system of open swales and box culverts and an underground system of 4- to 30-inch-diameter reinforced concrete pipe. As shown in Fig. 3.2-1, stormwater runoff in the parking areas flows from the topographic divide in the corner of the station toward the west (Aviation Blvd.) and northeast (El Segundo Blvd.). Storm water collected on the roofs and around the buildings is collected in catch basins and transmitted through underground concrete pipes to the southern boundary of the station, where it exits beneath the railway right-of-way through a reinforced concrete box into a paved ditch at the intersection of Wiseborn St. and Isis Ave.

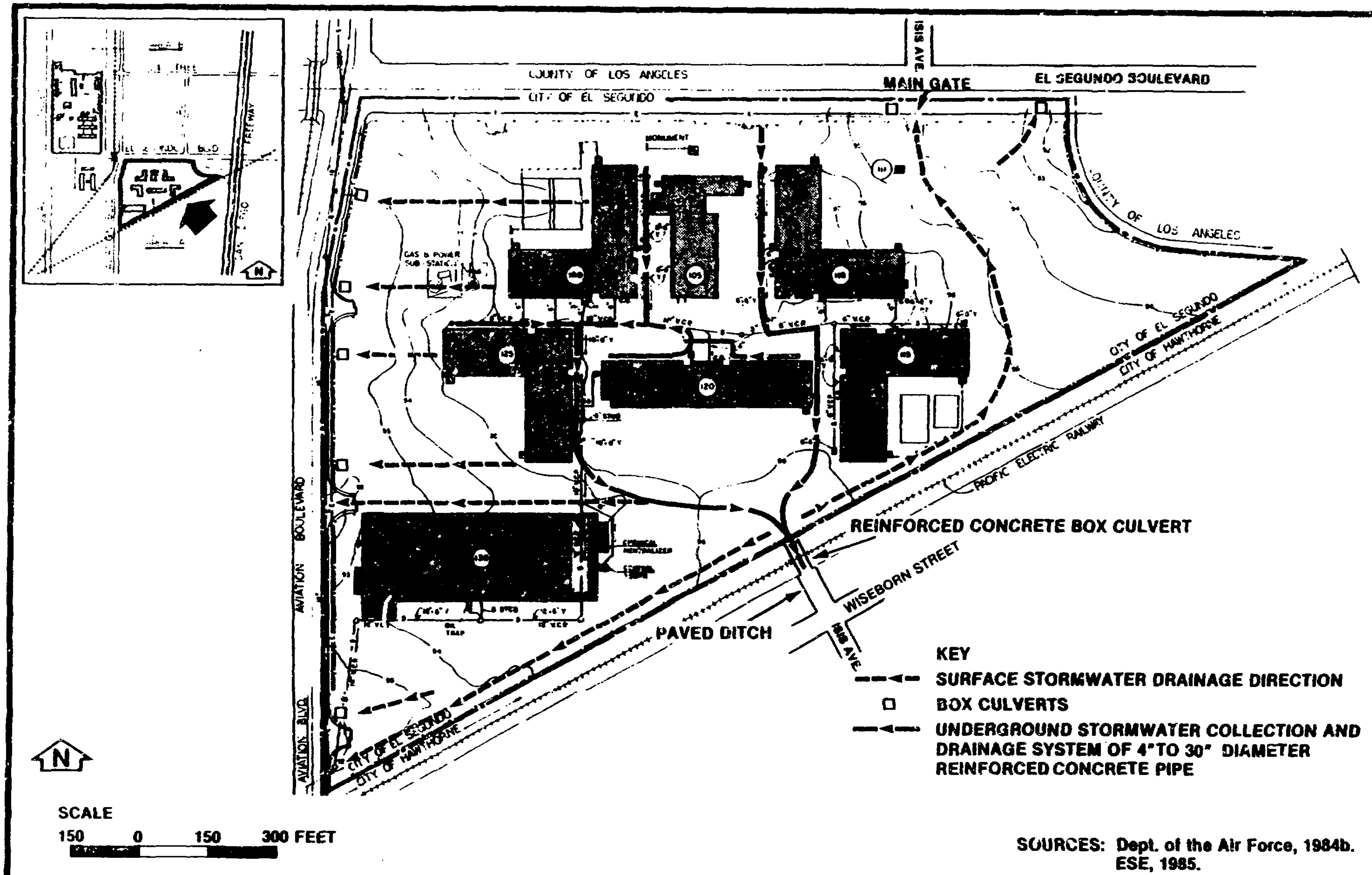
Stormwater runoff on Area B is collected in open catch basins and routed toward the southern boundary of the site through a system of 6- to 48-inch-diameter vitrified clay, cast iron, or reinforced concrete pipes. The major stormwater drainage pattern on Area B is shown on Fig. 3.2-2.

The stormwater drainage systems at both Areas A and B are connected to the Los Angeles County Flood Control District storm drainage system (Dept. of the Air Force, 1984b). Due to the extensive paved areas on the station, all rainfall (minus evaporation) leaves the installation in the form of stormwater runoff. Little infiltration of rainfall is expected to occur on the station.

3.3 GEOLOGY

3.3.1 GEOLOGIC SETTING

LAAFS lies within the Los Angeles Basin, a topographic lowland plain with a northwest trending axis approximately 50 miles in length and 20 miles wide. The stratigraphy of the Los Angeles Basin is characterized by both unconsolidated and indurated sediments ranging in age from Jurassic to Recent (see Fig. 3.3-1). Bedrock in the vicinity of LAAFS consists of metamorphic rocks of the Franciscan Formation and



SOURCES: Dept. of the Air Force, 1984b.
ESE, 1985.

Figure 3.2-1
STORMWATER DRAINAGE ON AREA A

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RESTORATION PROGRAM
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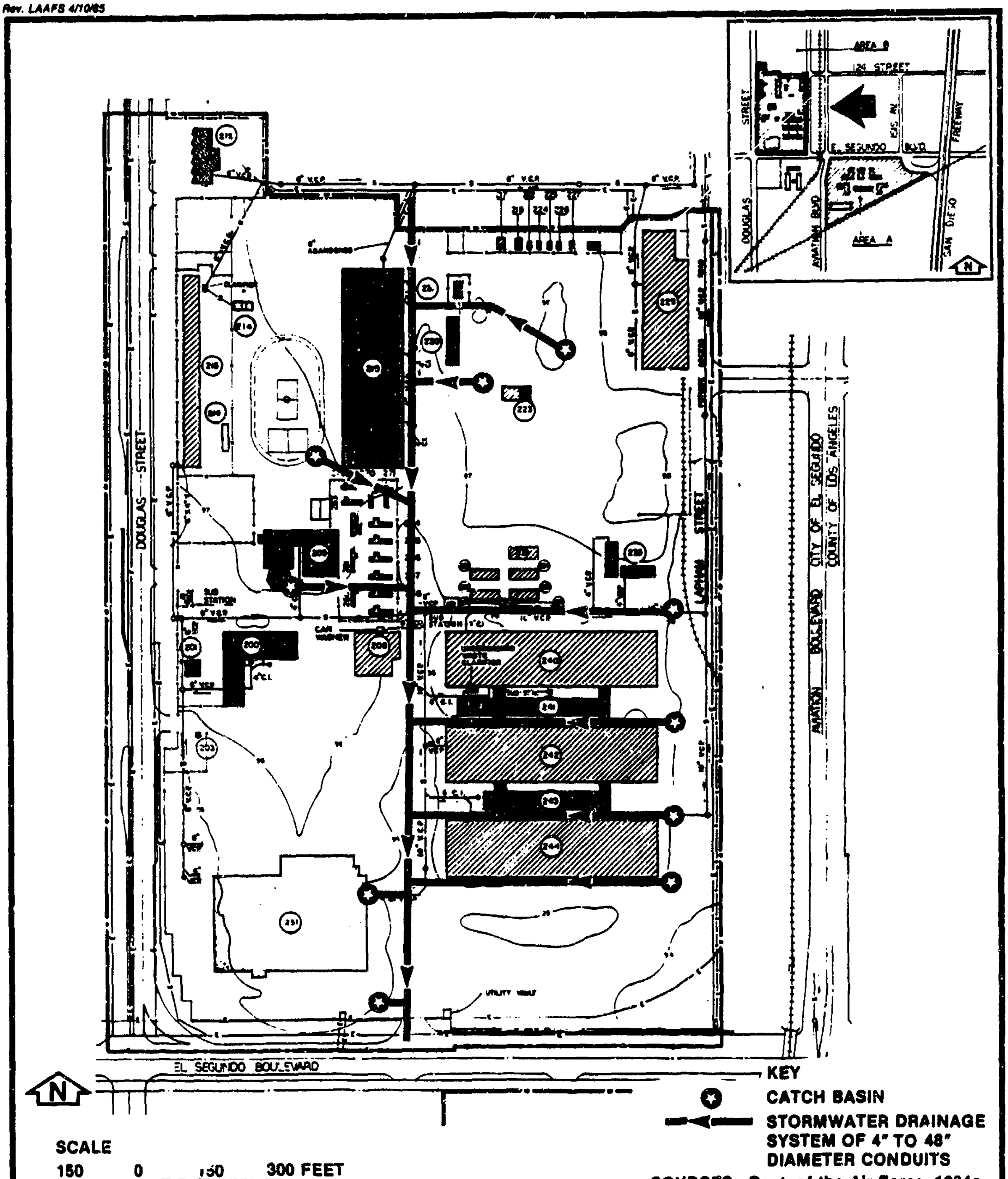
USAFLA 02/28/85



SOURCES: Dept. of the Air Force, 1984c. ESE, 1985.

Figure 3.2-2
STORMWATER DRAINAGE ON AREA B

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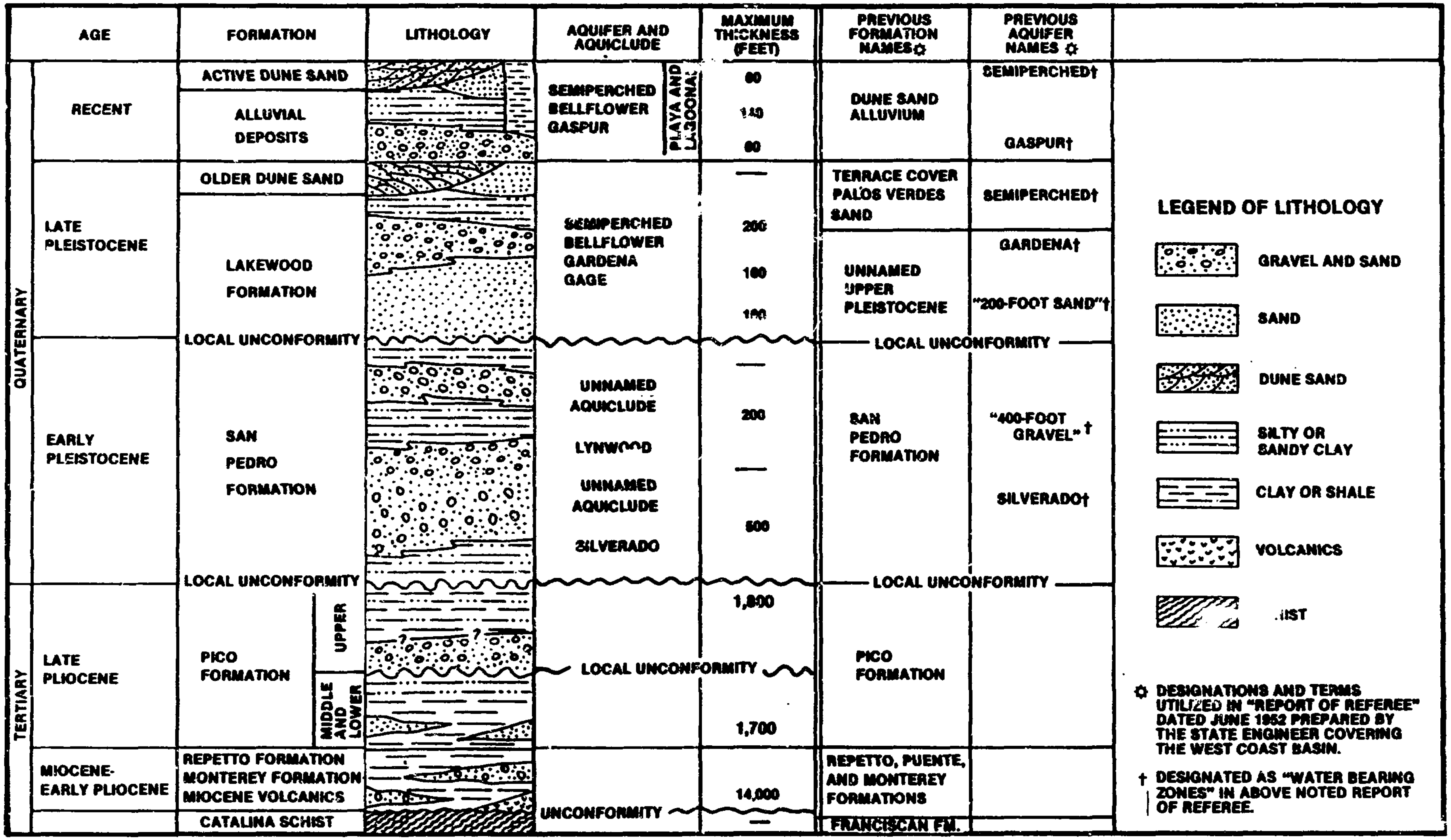

SOURCES: California Dept. of Water Resources, 1962. ESE, 1985.

Figure 3.3-1
GENERALIZED STRATIGRAPHY OF THE LOS ANGELES BASIN IN THE VICINITY OF LAAFS

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LOS ANGELES AIR FORCE STATION

Catalina Schist. These units are impervious and non-water-bearing and are overlain unconformably by rocks of Miocene age. The Miocene Monterey Formation consists of massive shale and claystone units. The bottom section of the Monterey exhibits coarse pebbly sandstone and schist-bearing conglomerate. The upper units of the formation are predominantly shale and micaceous siltstone. Fine to medium-grained sandstone units also occur within the upper section; however, these units are discontinuous and contain connate water with salinity near that of seawater. Overlying the Miocene units is a Pliocene age unit of the Pico Formation. This unit is divided into three subdivisions based on water-bearing characteristics and separated by local unconformities. The Lower Division, also referred to as the Repetto Formation, consists of fine to coarse sand with pebbly brown sandy siltstone and clay (California Dept. of Water Resources, 1977b). The Middle Division is predominantly massive marine siltstone with lesser amounts of fine to coarse sand. Both the Lower and Middle Divisions are largely impervious and contain saline water. The Upper Division of the Pico Formation averages 1,000 ft in thickness and consists of interbedded, semiconsolidated sand, micaceous silt with lesser marine clay and gravel members.

Overlying the Pico Formation are Early Pleistocene deposits forming the San Pedro Formation. The San Pedro consists of unconsolidated to semiconsolidated gravel, sand, silt, and clay of marine origin with partial influence and reworking by fluvial processes. The coarser sands and gravels are usually found in the lower two-thirds of the deposit. In the vicinity of LAAFS, lower Pleistocene deposits of the Lakewood Formation overlie the San Pedro Formation. The lower section of the Lakewood Formation consists of fluvial gravel, sand, silt, and clay with an approximate thickness of 200 to 300 ft. The upper section of the Lakewood grades into a fossiliferous marine sand and gravel overlain by a nonmarine sand and silt deposit. The youngest deposits underlying LAAFS consist of a thin veneer of late Pleistocene quartz dune sand. These deposits are mapped as the "Older Dune Sand" deposits (see

Fig. 3.3-2). The older dune sand consists of fine to medium-grained sands with minor amounts of gravel, sandy silt, and clay. These eolian deposits range up to 200 ft in thickness and exhibit thin, irregular, relatively dense cemented layers near the surface (Poland et al., 1956).

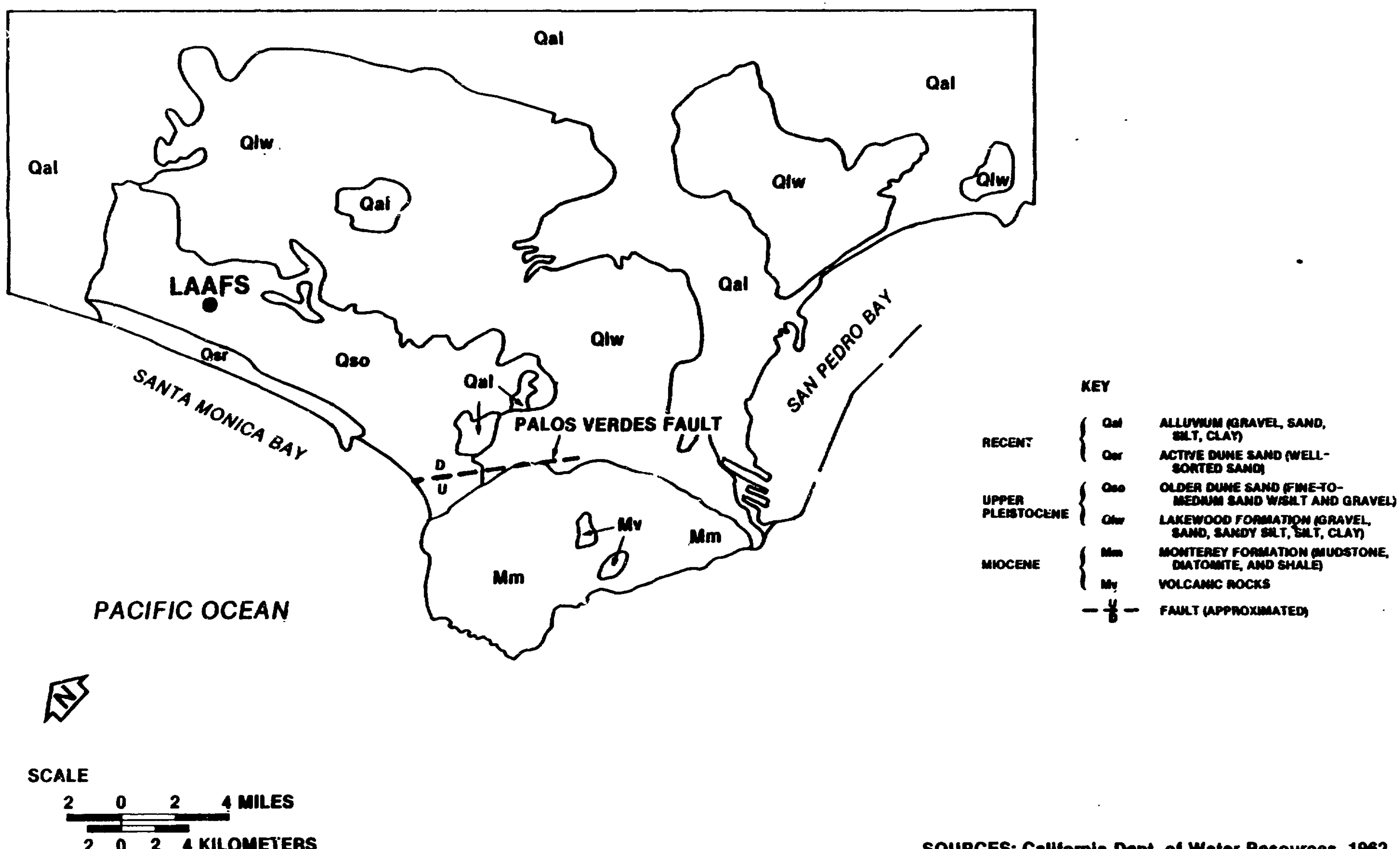
3.3.2 SOILS

Subsurface soil conditions at LAAFS were compiled from existing soil boring data collected at LAAFS (AFSC, 1981; Dames and Moore, 1977). The borings were taken for subsurface investigation prior to building installation and also as part of a gas seepage investigation. Much of LAAFS is paved with either concrete or asphaltic material, and little natural soil conditions exist. Borings have indicated up to 2 ft of fill material overlying natural soil. From the surface to approximately 5 ft, silty fine sand was encountered as the natural soil type. In fill areas, a clayey sandy soil with differing amounts of silt size material is encountered (see Fig. 3.3-3). From approximately 5 to 10 ft, clayey sand is the predominant soil type. Below 10 ft, silty fine sand completed the shallow soil profile. Ground water was not encountered within the top 30 to 35 ft of the borings.

Clayey, silty, sandy soils of the type encountered on LAAFS usually exhibit low permeability and low infiltration rates where exposed. However, due to the high percentage of pavement, most surface infiltration is restricted because surface drainage enters the storm sewer (see Sec. 3.2.2).

3.3.3 GEOHYDROLOGY

LAAFS is located in the West Coast Basin, which underlies 160 square miles of the Coastal Plain in the southwestern corner of the County of Los Angeles. The basin is bounded on the west and south by the Pacific Ocean. The basin's eastern boundary consists of a series of faults and folds, with the northern boundary formed by a structural uplift to the north of Los Angeles International Airport (Los Angeles County Flood Control District, 1970).



SOURCES: California Dept. of Water Resources, 1962.
ESE, 1985.

Figure 3.3-2
SURFICIAL GEOLOGY IN THE VICINITY OF LAAFS

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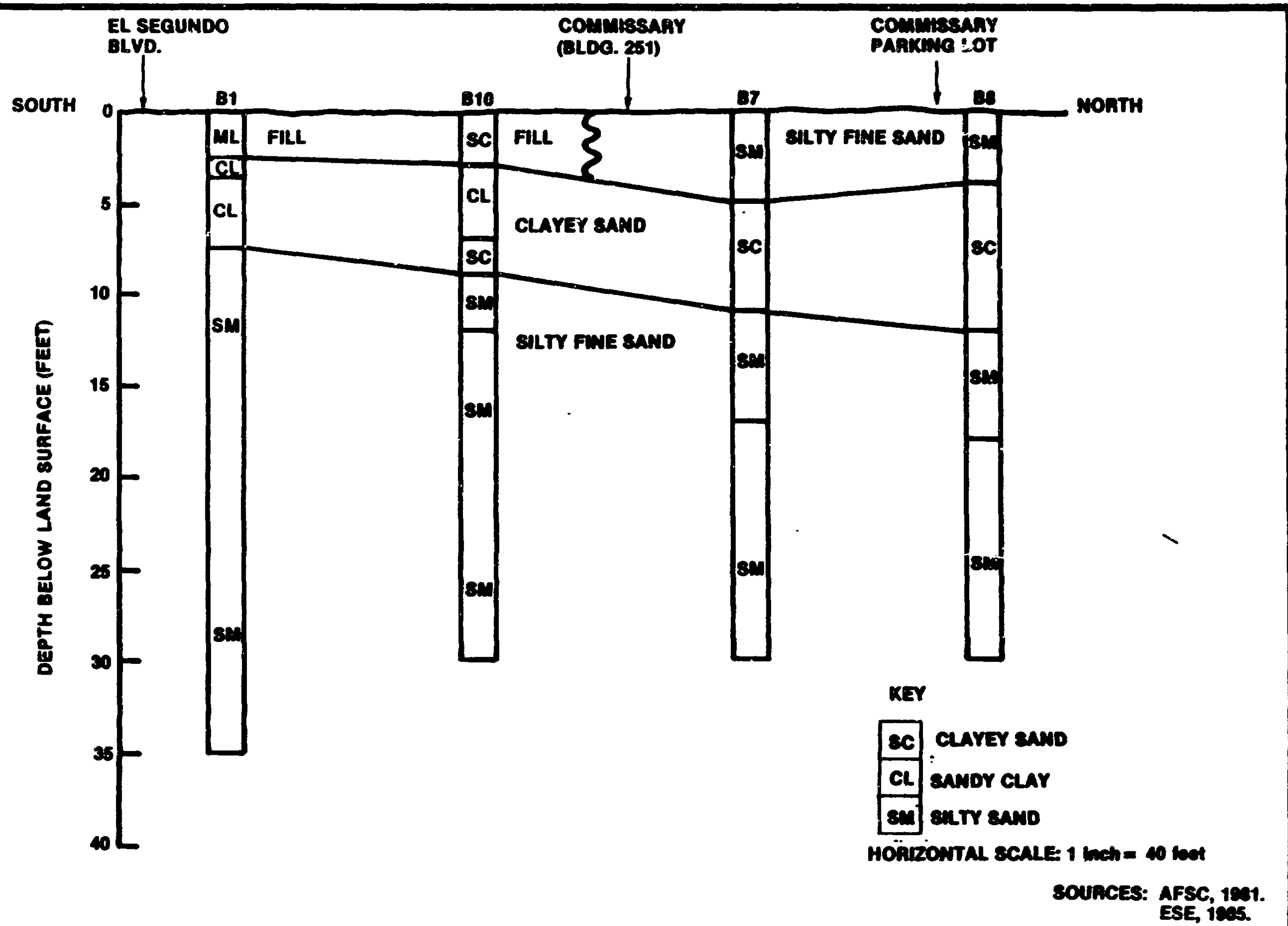

Figure 3.3-3
SHALLOW SOIL PROFILE AT LAAFS

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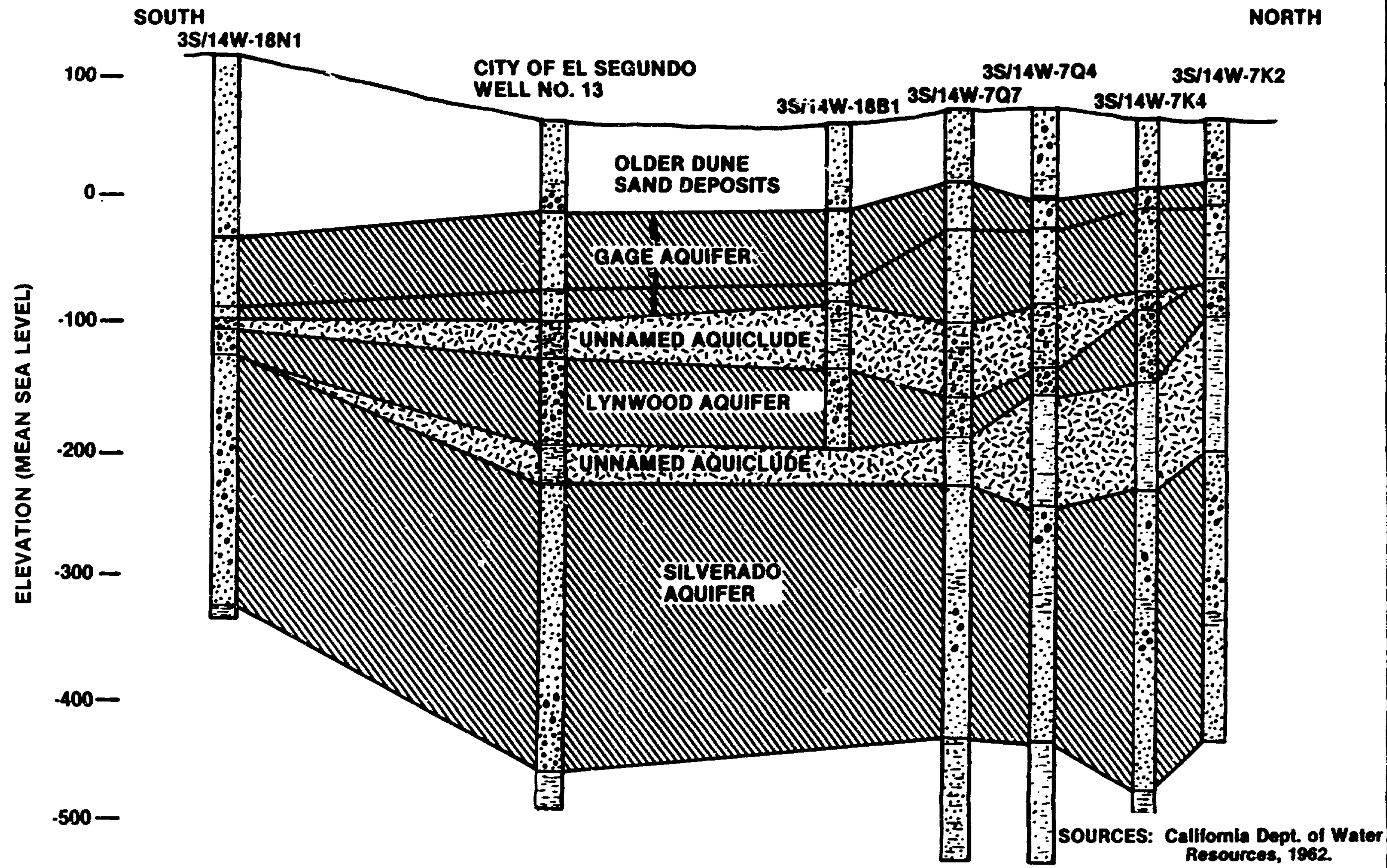
Ground water occurrences in the LAAFS region can be divided into four general classes, depending on the formation in which the aquifer occurs. As mentioned previously, the Monterey and Pico Formations contain connate ground water with high salinity, therefore eliminating the units as a potable water aquifer. The overlying San Pedro Formation contains two productive potable aquifer systems, the Silverado and Lynwood Aquifers. The third formation containing potable ground water is the Lakewood Formation. This formation consists of two productive systems termed the Gage and Gardena Aquifers. The shallowest ground water occurrence is found as a localized semiperched system in the basal section of the older dune sand. A geologic cross section along the western boundary (Douglas St.) of the installation (see Fig. 3.3-4) presents the hydrologic units and their approximate thickness in the vicinity of LAAFS. A generalized cross section of ground water flow directions in the vicinity of LAAFS is presented in Fig. 3.3-5.

Monterey and Pico Formations

The Miocene and Pliocene deposits underlying LAAFS are generally characterized as impervious shales, siltstone, and clay. Localized lenses of porous sandstone contain connate water with extremely high salinity. These water-bearing units are not used for potable supply due to the poor water quality. The Upper Division of the Pico Formation contains gravel in the top part of the deposit; water in this gravel exhibits low total dissolved solids but is not used for potable supply.

San Pedro Formation

The lowermost water-bearing zone in the San Pedro Formation is the Silverado Aquifer. This aquifer is the most extensive ground water reservoir in the West Coast Basin, with an estimated storage capacity of [illegible] million acre-feet (Los Angeles County Flood Control District, 1970). The aquifer has an area of approximately 120 square miles, and 90 percent of the basin's ground water is withdrawn from this aquifer. Recharge to the system occurs through artificial injection of state pro[illegible] water and Colorado River water, downward leakage, and



SOURCES: California Dept. of Water Resources, 1962.
ESE, 1985.

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Figure 3.3-4
HYDROGEOLOGIC CROSS SECTION ALONG THE WESTERN BOUNDARY OF LAAFS (DOUGLAS STREET)

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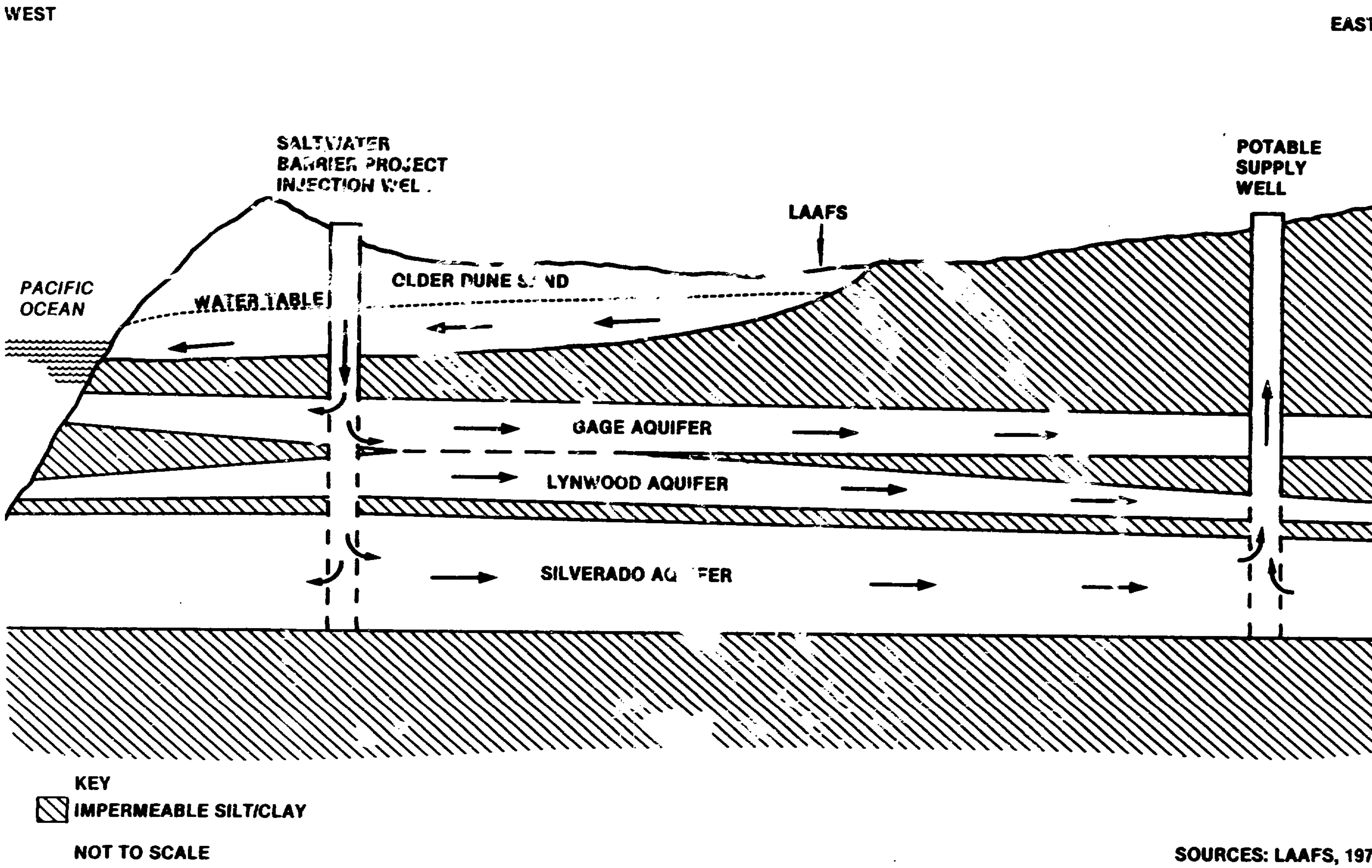

Figure 3.3-5
GENERALIZED GROUND WATER FLOW DIRECTION
IN THE VICINITY OF LAAFS

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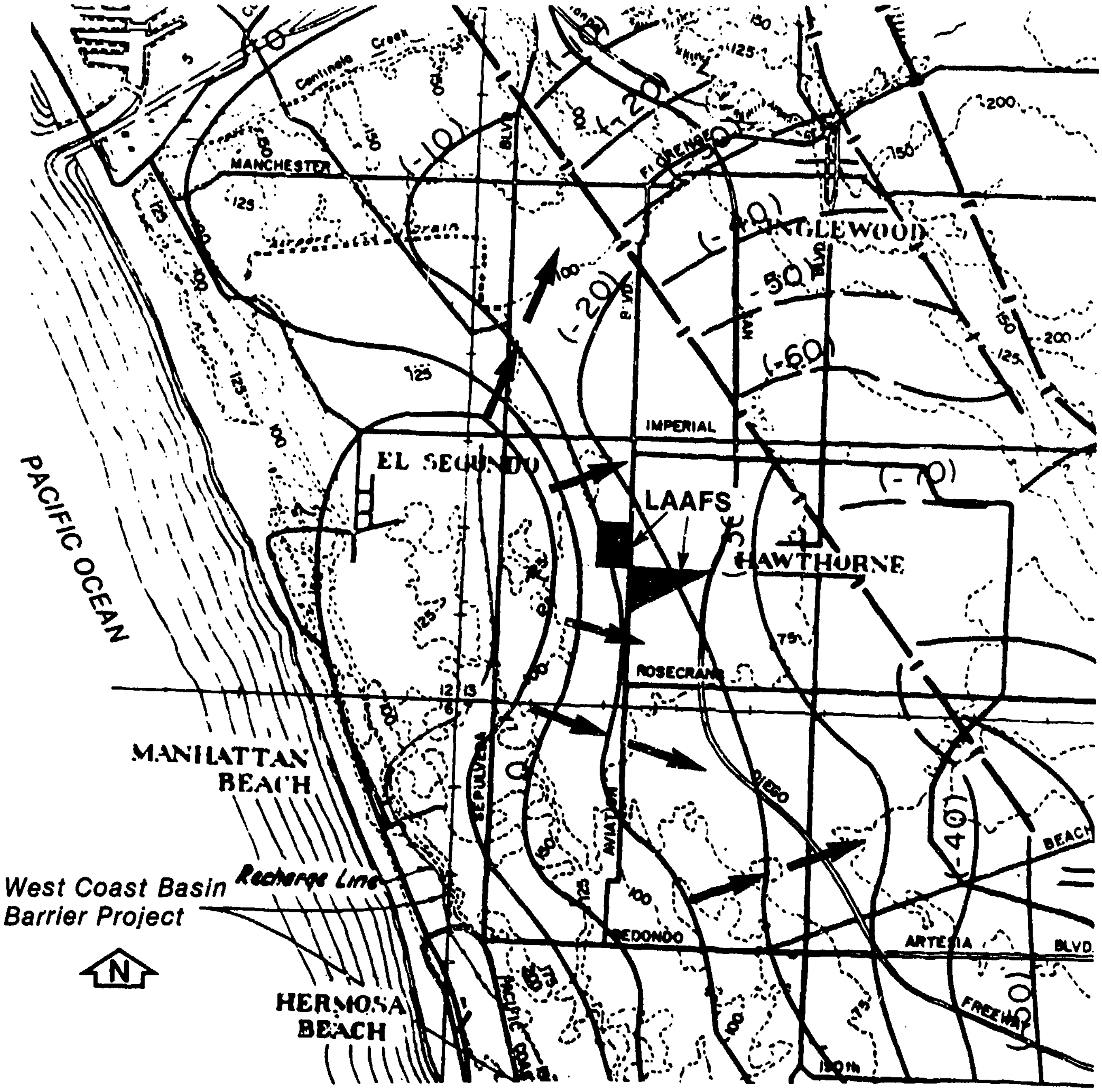
RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

infiltration in the outcrop area near the Palos Verdes Hills. The aquifer is confined by an unnamed aquiclude in the vicinity of LAAFS; however, the system is often in direct hydraulic continuity with the overlying Lynwood and Gage Aquifers. The Silverado Aquifer underlies LAAFS and has a thickness of approximately 200 ft. Regional ground water flow direction is shown to be northeast in a recent potentiometric map (see Fig. 3.3-6). However, older potentiometric maps (see Fig. 3.3-7) show the flow direction influenced by ground water pumping. In this case, flow direction is reversed to the northwest in the direction of the pumping well field. The potentiometric maps represent ground water elevation contours in a specific subsurface aquifer. In each aquifer, flow is perpendicular to the contours from areas of higher elevation (ft, msl) to areas of lower elevation, as indicated by the flow direction arrows. Well yields from the Silverado Aquifer range from 200 to 4,000 gallons per minute (gpm).

Overlying the Silverado Aquifer, and separated by an unnamed aquiclude, is the Lynwood Aquifer (see Fig. 3.3-4). This aquifer occurs throughout most of the West Coast Basin and is composed primarily of sand and gravel with localized lenses of sandy silt and fine sand. The aquifer has a thickness of between 20 and 80 ft in the vicinity of LAAFS. The Lynwood Aquifer exhibits a high transmissivity with yields of 500 to 600 gpm and higher. This aquifer was previously termed the "400-ft gravel." Flow gradients in this permeable unit are believed similar to that of the Silverado, with flow in an east-northeast direction.

<u>Lakewood Formation</u>

The Gage Aquifer is the lowest and oldest water-bearing zone in the Lakewood Formation. The aquifer or its lithologic equivalent extends throughout most of the West Coast Basin. This aquifer has also been referred to as the "200-ft sand" in other reports. The Gage Aquifer is composed primarily of sand with some gravel and thin beds of silt and clay. Beneath LAAFS the Gage has a thickness of between 50 and 120 ft. Recharge to the aquifer occurs by artificial injection and downward



KEY

(-10) GROUND WATER ELEVATION CONTOUR (ft MSL)

GROUND WATER FLOW DIRECTION

SOURCES: Los Angeles County Flood Control District, 1983.
ESE, 1985.

Figure 3.3-6
POTENTIOMETRIC SURFACE OF SILVERADO AQUIFER (ft MSL) NEAR LAAFS, FALL 1983

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LOS ANGELES AIR FORCE STATION

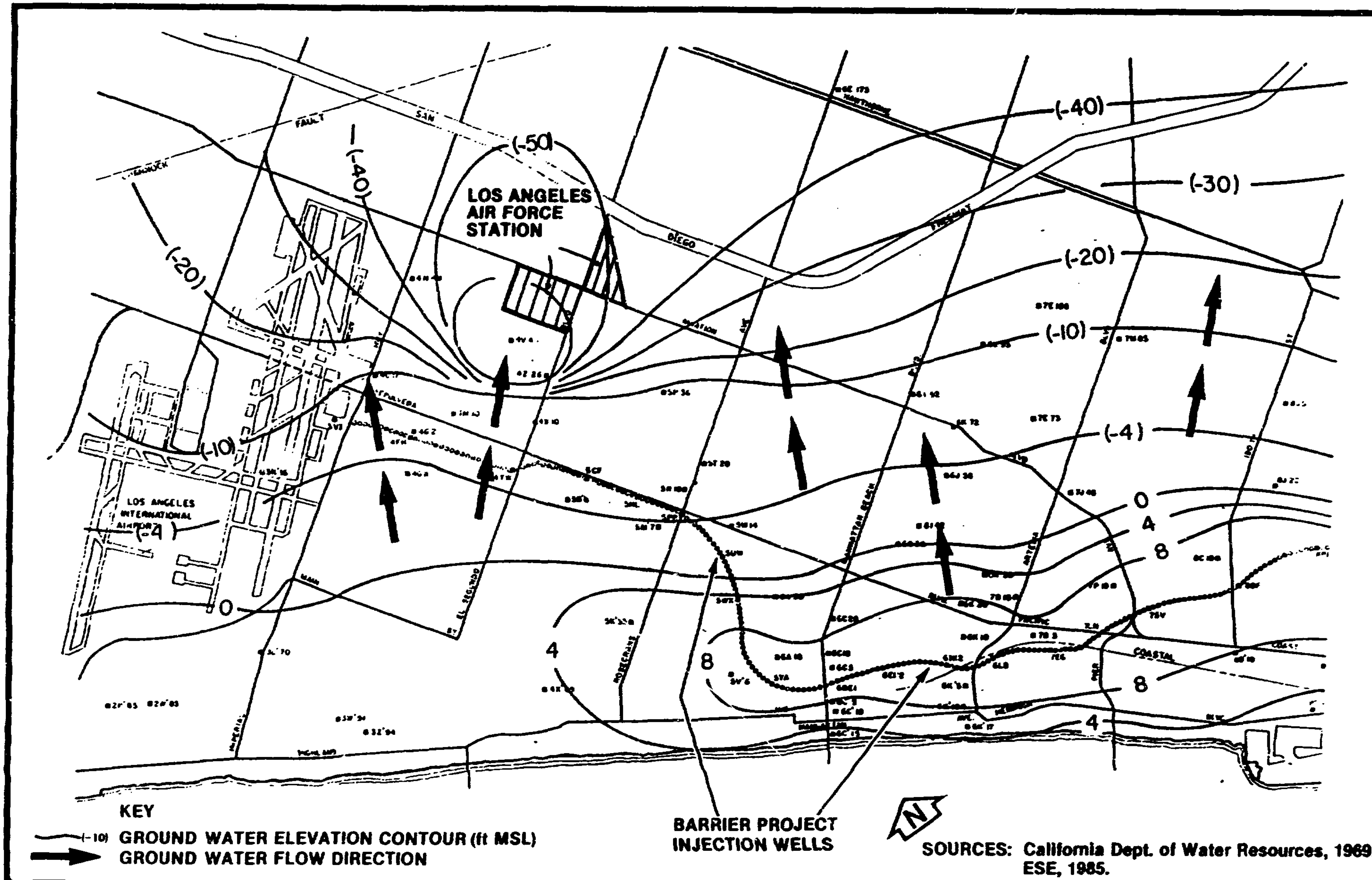

Figure 3.3-7
POTENTIOMETRIC MAP OF THE SILVERADO AQUIFER (ft MSL), SPRING 1968

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RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

leakage. Ground water flow direction in this aquifer at LAAFS is from west to east across the site (see Figs. 3.3-8 and 3.3-9). In general, the Gage Aquifer is a semiconfined aquifer with moderate permeability. Yields from this unit are variable and usually less than other aquifers in the vicinity.

Older Dune Sand

The uppermost water-bearing unit underlying LAAFS occurs as a semiperched, unconfined aquifer which is discontinuous over much of the West Coast Basin. The semiperched aquifer contains little available ground water in the vicinity of LAAFS. The existence of a clay and silty clay aquiclude controls the areal distribution of the semiperched aquifer. Examination of lithologic logs near LAAFS (see Fig. 3.3-4) reveals no aquiclude occurring in the older dune sand deposits. Ground water flow in this aquifer is generally in an east to west direction toward the Pacific Ocean.

Installation Wells

No potable water wells are located on LAAFS. All potable and industrial supply water is supplied by municipal sources. One monitor well is located on the extreme southwest corner of the installation near the intersection of El Segundo Blvd. and Douglas St. The well is maintained and monitored by the Los Angeles County Flood Control District. The well is part of a monitoring network set up by the Flood Control District to measure water-level elevations and salinity intrusion in the West Coast Basin. LAAFS does not perform or maintain any record of analyses from the well. A well log and water-level elevation data are presented in App. J. Additional salinity data are available from the Los Angeles County Flood Control District.

3.4 WATER QUALITY

3.4.1 SURFACE WATER QUALITY

No surface water features exist on LAAFS; thus, no surface water quality data are available. Stormwater drainage from the site enters the Los

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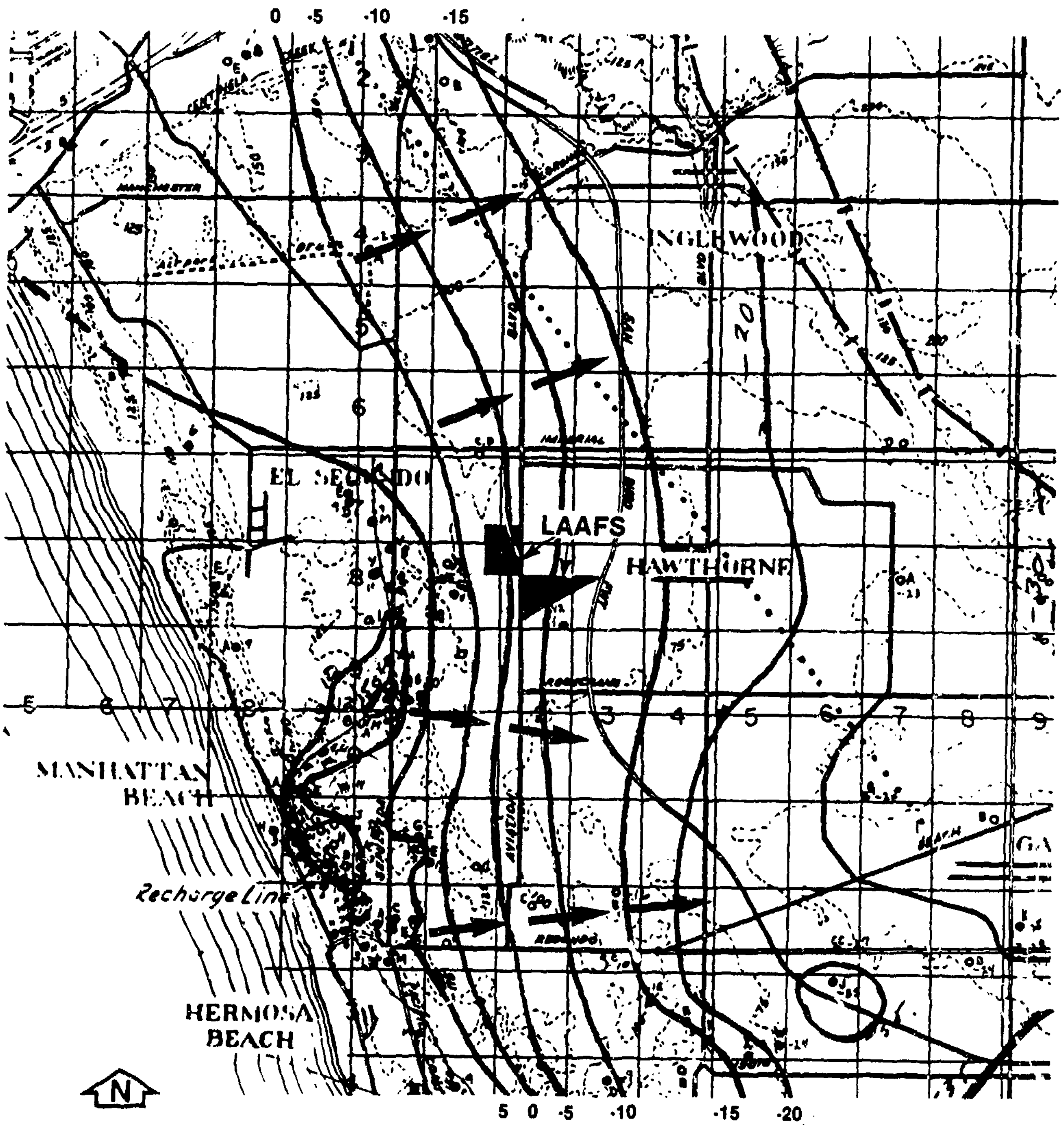

KEY

-10 GROUND WATER ELEVATION CONTOUR (ft MSL)

GROUND WATER FLOW DIRECTION

SOURCES: Los Angeles County Flood Control District, 1978.
ESE, 1985.

Figure 3.3-8
POTENTIOMETRIC SURFACE OF THE GAGE AQUIFER (ft MSL), FALL 1978

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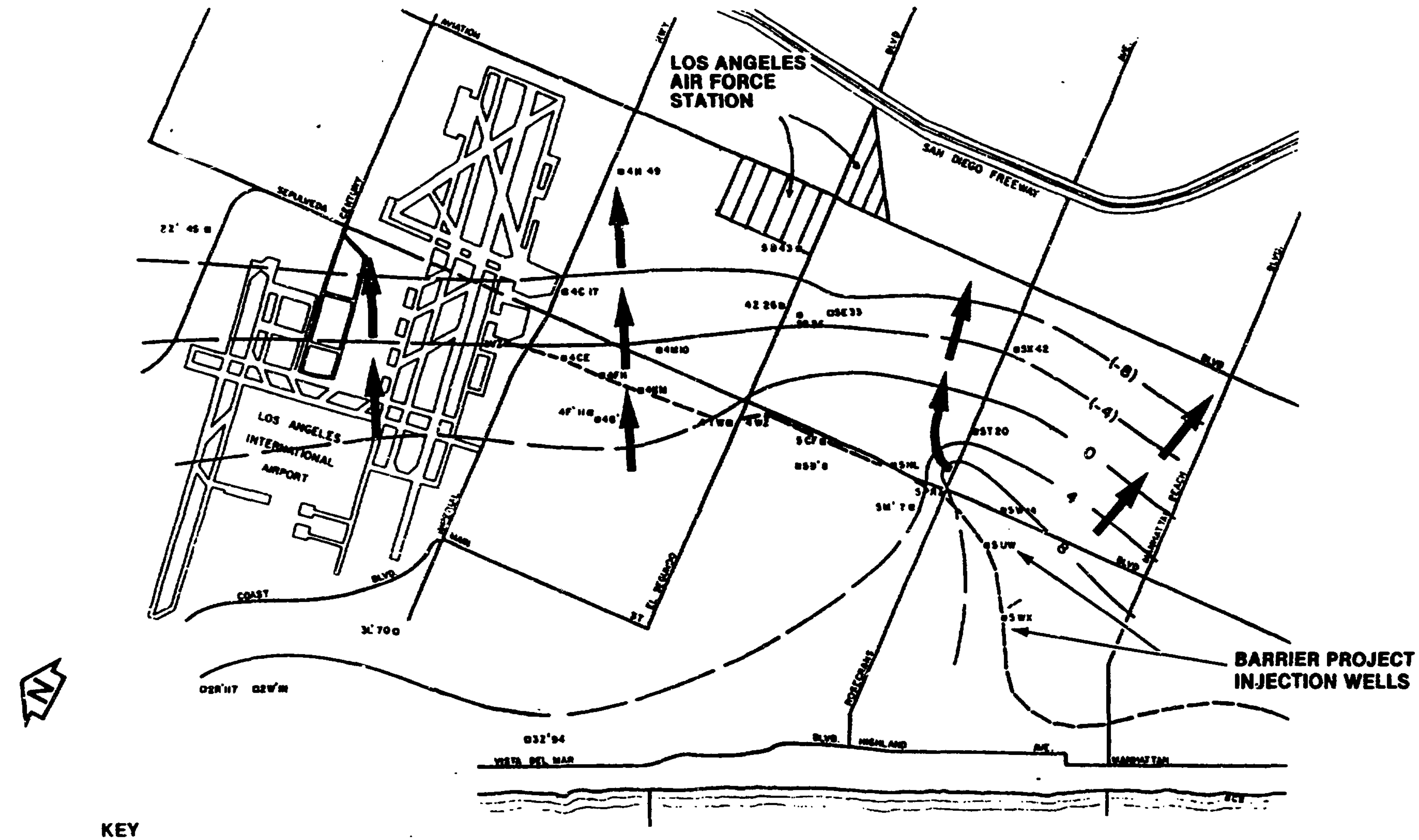
LOS ANGELES AIR FORCE STATION



KEY

GROUND WATER ELEVATION CONTOUR (ft MSL)

GROUND WATER FLOW DIRECTION

SOURCES: California Dept. of Water Resources, 1968. ESE, 1985.

Figure 3.3-9
POTENTIOMETRIC MAP OF THE GAGE AQUIFER (ft MSL), FALL 1967

INSTALLATION RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

Angeles County Flood Control District storm drainage system. While no specific data exist to quantify the quality of stormwater runoff from LAAFS, it likely is typical of stormwater drainage from the parking areas, streets, and other facilities in the area. No industrial discharges occur to the stormwater system.

3.4.2 GROUND WATER QUALITY

As described in Sec. 3.3, LAAFS is underlain by various geological formations, principally consisting of marine sand, gravel, and silt deposits. Several of these formations contain ground water and are used for regional water supply. No potable water supply wells are located on LAAFS. All potable water is supplied to the installation by connection to municipal sources.

Ground water quality data were obtained (California Dept. of Water Resources, 1977a) for wells in the vicinity of LAAFS. These data are presented in Table 3.4-1. As shown by the data, ground water in the vicinity of LAAFS is slightly alkaline, with moderate levels of hardness and dissolved solids. The mineral composition of the ground water reflects the marine origin of the aquifers. For example, the cationic component is dominated by sodium, calcium, and magnesium (Fig. 3.4-1), whereas the dominant anions are bicarbonate, chloride, and sulfate. Sodium chloride and sodium sulfate arise from seawater; calcium and magnesium bicarbonate result from dissolution of marine fossiliferous materials. The data depicted in Fig. 3.4-1 are the average concentrations for the data contained in Table 3.4-1.

The National Interim Primary Drinking Water Regulations (NIPDWR) (EPA, 1982a) contain a maximum contaminant level (MCL) of 45 milligrams per liter (mg/l) for nitrate. The chemical data indicate the ground water is well below the MCL.

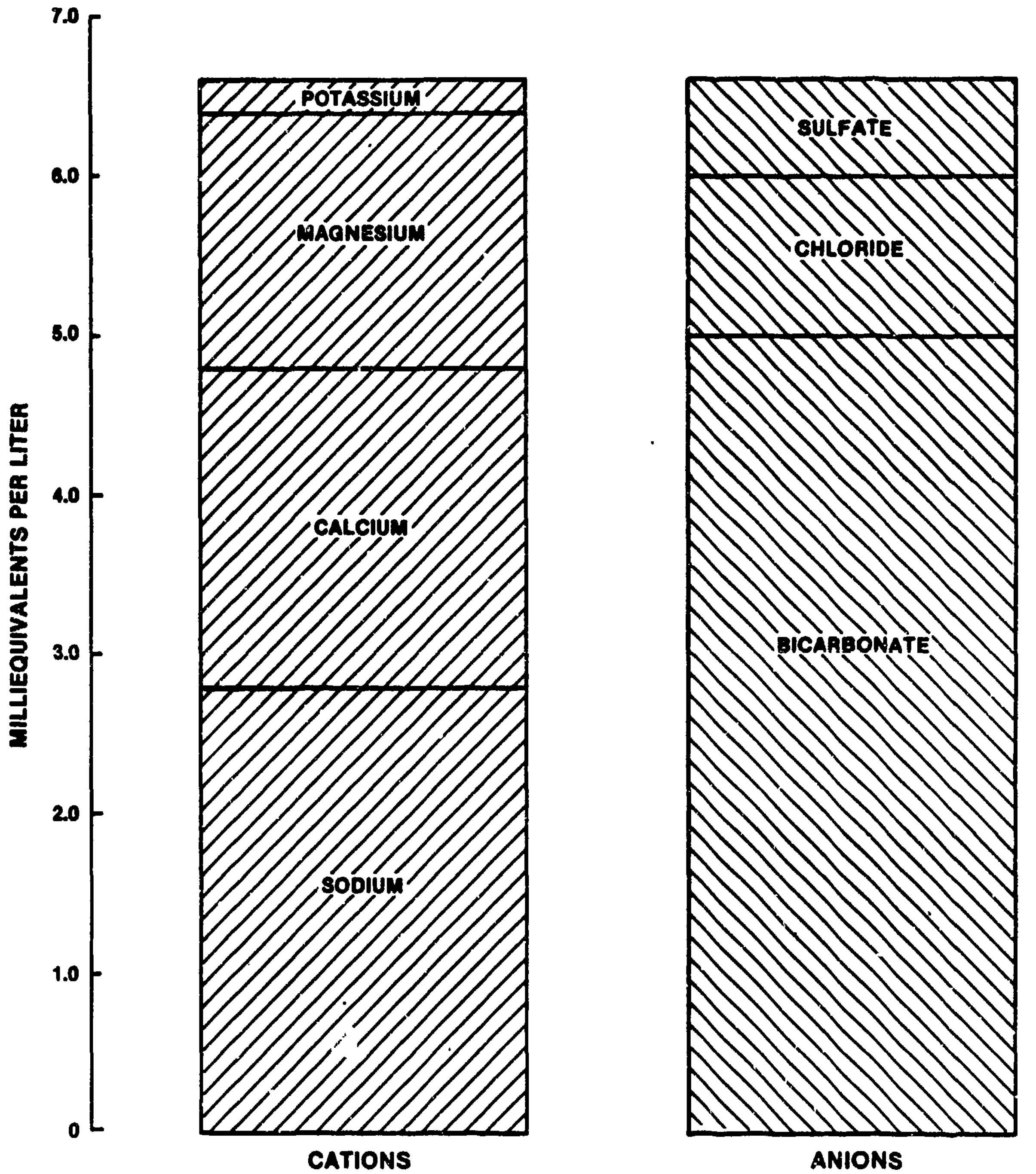
The National Secondary Drinking Water Regulations (NSDWR) (EPA, 1982b) contain MCLs for dissolved solids (500 mg/l), chloride (250 mg/l),

Table 3.4-1. Water Quality Data for Ground Water in the Vicinity of LAAFS

Parameter	Well Identification Number			
	3S/14W-9M1	3S/14W-9N4	3S/14W-9N5	3S/14W-21M1
Temperature (°C)	23	24	24	24
pH (Units)	8.3	8.3	8.2	8.4
Specific Conductance (umhos/cm)*	671	638	635	543
Total Dissolved Solids (mg/l)	373	374	356	313
Total Hardness (mg/l as calcium carbonate)	189	176	167	152
Calcium (mg/l)	43.0	43.0	42.0	38.0
Magnesium (mg/l)	19.0	16.0	15.0	13.0
Sodium (mg/l)	70.0	67.0	75.0	58.0
Potassium (mg/l)	7.9	8.0	8.2	6.7
Bicarbonate (mg/l)	339.0	338.0	306.0	269.0
Sulfate (mg/l)	1.0	2.0	35.0	27.0
Chloride (mg/l)	54.0	41.0	41.0	32.0
Nitrate (mg/l)	0.1	0.1	0.1	0.1

*umhos/cm = micromhos per centimeter.

Sources: California Dept. of Water Resources, 1977a.
ESE, 1985.



SOURCE: ESE, 1985.

Figure 3.4-1
CHEMICAL COMPOSITION OF GROUND WATER IN THE VICINITY OF LAAFS

INSTALLATION RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

sulfate (250 mg/l), and pH (6.5-8.5). As shown by the data in Table 3.4-1, the ground water quality is within the NSDWR MCLs for these parameters.

3.4.3 POTABLE WATER QUALITY

Potable water at LAAFS is supplied by two purveyors. Area A is served by Southern California Water Company, and Area B is served by the City of El Segundo through the Metropolitan Water District of Southern California. No potable wells have been installed at LAAFS.

Available analyses for the two purveyors include a limited number of health-related NIPDWR and NSDWR parameters. In general, water supplied to Areas A and B on LAAFS is within the primary and secondary drinking water standards for parameters analyzed. Detailed analyses of base water samples were not available at LAAFS. Water analysis data provided by the water purveyors are presented in App. K.

Bacteriological sampling at LAAFS is conducted weekly through Bioenvironmental Engineering (BEE). Sampling locations for bacteriological sampling and analysis are presented in Table 3.4-2. Review of existing water quality data at LAAFS indicates no bacteriological problem associated with the potable water supplied to LAAFS.

3.5 BIOTIC COMMUNITIES

LAAFS is situated in an area bordering light industrial activity (to the north and west) and residential land use (to the east and south). The installation is almost entirely used for buildings and associated, paved parking areas. No natural vegetation communities and only scattered plantings of ornamental trees and shrubs (e.g., in the courtyard of Area A) occur on the installation. As a result of the urban setting and lack of available habitat, wildlife diversity is low. No wildlife surveys or species counts have been conducted for the installation. The following paragraphs describe species which generally occur in urban areas of southern California.

Table 3.4-2. Bacteriological Collection Schedule, Locations, and Water Purveyors at LAAFS

Collection Points	Building	Water Purveyor
Week A (first week of the month)		
Health Education (Rm. 103)	200 (Area B)	City of El Segundo
Industrial Sink (Rm. 118)	229 (Area B)	City of El Segundo
O-Club Kitchen	120 (Area A)	Southern California Water Company
Rm. 1540 (restroom)	130 (Area A)	Southern California Water Company
Week B (second week of the month)		
NCO Club Kitchen	208 (Area B)	City of El Segundo
Snack Room (Rm. 108)	212 (Area B)	City of El Segundo
Rm. 1310 (restroom)	100 (Area A)	Southern California Water Company
Rm. 1127 (restroom)	105 (Area A)	Southern California Water Company
Week C (third week of the month)		
Rm. 1730 (restroom)	219 (Area B)	City of El Segundo
Rm. 2A (sink)	244 (Area B)	City of El Segundo
Rm. 1310 (restroom)	110 (Area A)	Southern California Water Company
Rm. 1310 (LAAFS)	115 (Area A)	Southern California Water Company
Week D (fourth week of the month)		
Open Bay Area Sink	240 (Area B)	City of El Segundo
Med. Food Insp. Office	251 (Area B)	City of El Segundo
Rm. 114 (restroom)	120 (Area A)	Southern California Water Company
Rm. 1310 (restroom)	125 (Area A)	Southern California Water Company

Sources: BEE, 1985.
ESE, 1985.

Birds that may occur onbase include the mourning dove (Zenaidura macroura), raven (Corvus corax), robin (Turdus migratorius), yellow-rumped warbler (Dendroica coronata), flicker (Colaptes auratus), and downy woodpecker (Dendrocopus publescens) (Yocom and Dasmann, 1965). Although these birds may forage in the trees on Area A, few areas are suitable for nesting.

Due to the human activity and lack of habitat on the base, few mammalian wildlife species are expected to occur. Mammalian species would be limited to mice (e.g., Peromyscus maniculatus) and possibly moles (e.g., Scapanus townsendi). Herpetiles would be limited to the western garter snake (Thammophis sirtalis), western skink (Eumeces skiltoniamus), and western toad (Bufo boreas) (Yocom and Dasmann, 1965).

No threatened or endangered species are expected to occur due to the absence of required habitat.

3.6 ENVIRONMENTAL SETTING SUMMARY

LAAFS is situated in a developed area of Los Angeles dominated by aerospace industries. A residential housing development is situated immediately south of Area A. Due to their small size, Areas A and B are dominated by buildings, with all open areas essentially used as asphalt-paved vehicle parking. The small amount of natural soils exposed on the installation is used for ornamental landscaping. Both parcels of land are relatively flat, with surface elevations ranging from 92 to 98 ft above MSL.

Stormwater runoff is collected in open catch basins and routed through a system of vitrified clay, cast iron, or reinforced concrete pipes to the Los Angeles County Flood Control District storm drainage system. Due to the extensive paved areas on the station, all rainfall (minus evaporation) leaves the installation in the form of stormwater runoff. Little infiltration of rainfall is expected to occur on the station.

The climate of the area is mild, with temperatures moderated by the Pacific Ocean. The average monthly temperature ranges from a low of 56.0°F in January to a high of 70.3°F in August. The annual average rainfall is 12.08 inches, 87 percent of which occurs in the winter months (November through March). Net precipitation is -33.92 inches per year and the 1-year, 24-hour rainfall event is 3 inches. The low value for net precipitation indicates a low potential for significant infiltration or the formation of permanent surface water features. The 1-year, 24-hour rainfall event of 3 inches indicates a moderate potential for runoff and erosion. The majority of the installation, however, is asphalt-paved and contains stormwater drainage systems to control runoff, thus eliminating any significant potential for flooding and soil erosion.

The near-surface soils on LAAFS are clayey, silty sands with predominantly silty, fine sands below about 10 ft. Due to the large amount of paved areas, most surface infiltration is restricted because surface drainage enters the storm sewer system.

Ground water occurrences can be divided into four general classes, depending on the formation in which the aquifer occurs. The Monterey and Pico Formations contain connate ground water with high salinity, therefore eliminating the units as a potable water aquifer. The overlying San Pedro Formation contains two productive potable aquifer systems, the Silverado and Lynwood Aquifers. The third formation containing potable ground water is the Lakewood Formation. This formation consists of two productive systems termed the Gage and Gardena Aquifers. The shallowest ground water occurrence is found as a localized semiperched system in the basal section of the older dune sand. Depth to this uppermost ground water is approximately 50 ft in the vicinity of LAAFS. Due to limited quantities, the shallow ground water is not used as a potable, industrial, or municipal source. The deeper aquifers are separated from the shallow, semiperched aquifer by aquicludes.

As a result of the urban setting and associated lack of available habitat, few wildlife species occur on LAAFS. Various urban bird species likely forage in the trees on Area A, and common rodents (e.g., mice) would be expected to occur onbase. No threatened or endangered species are present.

4.0 FINDINGS

To assess hazardous waste management at LAAFS, past activities of waste generation and disposal methods were reviewed. This section contains a summary of hazardous wastes generated, descriptions of waste disposal methods, identification of the disposal sites onbase, and evaluation of the potential for environmental contamination.

4.1 CURRENT AND PAST ACTIVITY REVIEW

To identify past activities that resulted in generation and disposal of hazardous waste, current and past waste generation and disposal methods were reviewed. This activity consisted of a review of files and records, examination of engineering diagrams for buildings and sanitary and storm sewer systems, interviews with current and former base employees, and site inspections.

LAAFS operations described in this section are those which handle, store, or dispose of potentially toxic or hazardous materials. These operations include industrial and laboratory operations and activities in which pesticides; polychlorinated biphenyls (PCB); petroleum, oils, and lubricants (POL) (including organic solvents); radiological materials; and explosives are handled.

Prior to USAF's acquisition of LAAFS (Area B) in 1962, Douglas Aircraft Co. occupied the facilities and produced aircraft for the U.S. Navy. Industrial operations of the Douglas Aircraft Co. included manufacture of fighter aircraft, engine testing and runup, and sighting in of wing guns. Specific information on [illegible]e generation types, quantities, and disposal practices is largely unknown. Available information on Douglas Aircraft Co. activities suggests that no waste materials were disposed of onsite, instead wastes were disposed of at offsite landfills or discharged to the sanitary sewer and storm drain systems. Examination

of engineering diagrams for the buildings on Area B did not indicate that sumps, dry wells, or septic tanks were used for waste disposal. Additionally, no landfills were known to have been located on Area B.

Since 1962, no large-scale product-manufacturing operations have been conducted at LAAFS. Industrial operations conducted at LAAFS are primarily maintenance-support functions provided for facilities, electronic equipment, and ground vehicles.

Historically, various disposal practices for wastes generated on LAAFS have been used. Past waste disposal methods (e.g., landfilling, ocean disposal) conformed to standard practices for that time. With the promulgation of State of California and U.S. EPA regulations in the 1970s controlling toxic and hazardous materials, many disposal practices changed. Since then, regulated wastes have been disposed of by hazardous waste contractors in approved hazardous waste disposal facilities.

Since the early 1960s, industrial activity at LAAFS has remained generally constant. Often, specific information concerning waste generation rates and waste types of the early industrial activity was not available during the onsite survey. Therefore, unless otherwise stated, current waste types, generation rates, and shop locations are assumed to be representative of historical activity. App. E contains a list of shops currently operating on LAAFS. Past and current shops, activities, and waste treatment, storage, and disposal practices are discussed in this section.

Maintenance operations on LAAFS have been performed by contractors since the mid-1960s. Since 1984, Pacifica Services, Inc. has been the operating contractor. Past contractors responsible for maintenance have been Trend Western Technical Corp. (1979 to 1984), Action Industries (1971 to 1979), TECDATA (1969 to 1971), TUMPANE (1966 to 1969), and Aerospace Corp. (1960 to 1966).

A summary of waste generation from LAAFS industrial operations is presented in Table 4.1-1. Industrial shops; activities; and waste treatment, storage, and disposal are described in the following paragraphs. (Waste disposal, hazardous or otherwise, that is handled by contract will be referred to as "contract disposal" throughout this report.)

4.1.1 INDUSTRIAL OPERATIONS

4.1.1.1 6592D AIR BASE GROUP

CIVIL ENGINEERING DIVISION

Paint Shop

The Civil Engineering Paint Shop (Bldg. 223) generates waste paint thinner and turpentine [55 gallons per year (gal/yr)], lacquer thinner (55 gal/yr), paint stripper (55 gal/yr), water-based paint (3 gal/yr), and unusable paint (<10 gal/yr). Since operational startup in 1963, waste paint thinner, turpentine, lacquer thinner, and stripper have been contract disposed. Waste water-based paint has been discharged to the sanitary sewer system since 1963. Unusable paint always has been sent to the Defense Property Disposal Office (DPDO) for salvage.

Sheet Metal and Welding Shop

The Sheet Metal and Welding Shop (Bldg. 228) generates waste cutting oil mixed with metal fragments (3 gal/yr). Since 1963, this waste has been contract disposed.

Carpentry Shop

The Civil Engineering Carpentry Shop (Bldg. 229) generates empty cans containing traces of asphaltic and plastic roofing tar (20 cans/yr) and empty cans containing traces of floor tile adhesive (100 cans/yr). Since 1963, these wastes have been hauled to an offbase sanitary landfill for disposal.

Table 4.1-1. Los Angeles AFS Industrial Operations--Waste Generation

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1955 1960 1965 1970 1975 1980)
I. 6592D AIR BASE GROUP				
A. Civil Engineering Division				
1. Paint Shop	223	Paint thinner and turpentine	55	Contract disposal
		Lacquer thinner	55	Contract disposal
		Paint stripper (mixed with waste paint and water)	55	Contract disposal
		Water-based paint	3	Discharged to sanitary sewer
		Unusable paint	<10	Sent to DPDO for salvage
2. Sheet Metal and Welding Shop	228	Cutting oil mixed with metal fragments	3	Contract disposal
3. Carpentry Shop	229	Empty cans containing traces of asphaltic and plastic roofing tar	20 cans/yr	Hauled to offbase sanitary landfill
		Empty cans containing traces of floor tile adhesive	100 cans/yr	Hauled to offbase sanitary landfill

Table 4.1-1. Los Angeles AFS Industrial Operations--Waste Generation (Continued, Page 2 of 5)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices (1955 / 1960 / 1965 / 1970 / 1975 / 1980)
4. Pavement and Grounds Section	228, 229	Broken asphalt pavement from repairs	20 yd^3/yr	Hauled to offbase sanitary landfill (1965 →)
		Diesel fuel	≤55	Evaporated to atmosphere in shop area (1965 →)
		Lube oil	220	Contract disposal (1965 →)
		Solvent (chlorinated type since 1984, type unknown prior to 1984)	5	Contract disposal (1965 →)
		Brake linings (asbestos)	Variable (small)	Hauled to offbase sanitary landfill (1965 →); Hauled to offbase hazardous waste land-fill (→)
		Automobile batteries	Variable (small)	Returned to supplier (1965 →)
5. Electrical-Mechanical Shop	228, 229	Lube oil	30	Contract disposal (1970 →)
		PCB transformers	Variable	Disposed of through DPDO Contract Disposal (→)
6. Heating and Air Conditioning Shop	228, 229	Water contaminated with diesel fuel and fuel sludge	120	Contract disposal (1970 →)

Table 4.1-1. Los Angeles AFS Industrial Operations--Waste Generation (Continued, Page 3 of 5)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices 1955 1960 1965 1970 1975 1980
7. Water Treatment				
a. Cooling Towers	100, 105, 110, 115, 120, 125, 130	Coil cleaner (diluted sulfuric acid	Variable	Discharged to sanitary sewer (1966 →)
		Corrosion inhibitor (sodium dichromate dihydrate, sodium hydroxide, calcium hypochlorite, and methylene bis-thiocyanate)	1,700	Diluted and discharged to sanitary sewer (1955 →)
b. Steam Boilers	120, 241	Blowdown (antifoam and dispersant)	2,200	Discharged to sanitary sewer (1955 →)
c. Chillers and Hot-Water Boilers	Basewide	Corrosion inhibitors (sodium nitrate-nitrite, borate)	Variable	Discharged to sanitary sewer (1955 →)
d. Water Softeners	120, 130, 241	Softener backwash (sodium chloride solution)	1.3×10^6	Discharged to sanitary sewer (1955 →)
8. Facilities Engineering	229	Solid waste	Variable	Hauled to offbase sanitary landfill (1962 →)
		Sanitary sewage	Variable	Discharged to the regional sanitary sewer (1962 →)
B. Recreation Services Branch				
Auto Hobby Shop	215	Lube oil and solvents (carburetor cleaner and Stoddard solvent)	1,100	Contract disposal (1963 →)

Table 4.1-1. Los Angeles AFS Industrial Operations--Waste Generation (Continued, Page 4 of 5)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices 1955 1960 1965 1970 1975 1980
B. Recreation Services Branch Auto Hobby Shop (continued)	215	Brake linings	Variable	Hauled to offbase sanitary landfill
	215	Aircraft-cleaning compound	2,000	Discharged to sanitary sewer
	214	Washrack wastewater	Variable	Discharge to sanitary Sewer
	214	Sludge from washrack clarifier	Variable	Contract disposal
C. Transportation Branch--Vehicle Maintenance	250 (1967 to 1978), 219 (since 1978)	Lube oil	110	Contract disposal
		Brake linings	Up to 12/yr	Returned to supplier
		Brake dust	Variable (small)	Hauled to offbase sanitary landfill
		Batteries	Variable (small)	Returned to supplier
		Vehicle wash wastewater (containing detergent)	Variable	Discharged to storm drain
D. Reprographics Branch	244	Solvent-contaminated rags	Variable (small)	Returned to supplier; Hauled to offbase sanitary landfill
II. TENANTS				
A. 2080th Communications Squadron	130	Spent mercury batteries	40/yr	Contract disposal

Table 4.1-1. Los Angeles AFS Industrial Operations--Waste Generation (Continued, Page 5 of 5)

Shop Name	Location (Bldg. No.)	Waste Material	Waste Quantity (gal/yr)*	Waste Management Practices 1955 1960 1965 1970 1975 1980
B. BX Service Station	235	Oil (lube oil and oil/water separator wastes)	2,400	Contract disposal
		Solvent (chlorinated, type unknown)	200	Contract disposal
		Solvent (non-chlorinated)	200	Contract disposal
		Batteries	Variable	Returned to supplier
		Brake linings	Variable	Returned to supplier
		Brake dust	Variable	Hauled to offbase sanitary landfill

*Unit of measurement is gallons per year (gal/yr) unless indicated otherwise.

Key:
- Confirmed timeframe and disposal data from shop personnel.
- Estimated timeframe and disposal data from shop personnel.
- Arrow indicates current practice at time of site visit.

Source: ESE, 1985.

Pavement and Grounds Section

In addition to providing grounds maintenance, the Pavement and Grounds Section (Bldgs. 228 and 229) maintains roadworking equipment and tools. Waste generation through normal operations includes broken pavement from minor repair work [20 cubic yards (yd^3)/yr], diesel fuel <55 gal/yr), lube oil (220 gal/yr), solvent (5 gal/yr), brake linings containing asbestos (variable quantity), and automotive batteries (variable but small quantity). Since 1963, the broken pavement has been hauled to an offbase sanitary landfill, and the waste diesel fuel, which is kept in a 55-gal drum and used to clean equipment of asphalt, has been allowed to evaporate to the atmosphere in the shop area. Also since 1963, the waste lube oil and solvent have been contract disposed, and batteries have been returned to the supplier. From 1963 to 1985, asbestos-containing brake linings were disposed of in offbase, municipal sanitary landfills. Since 1985, these wastes have been disposed of in a designated hazardous waste landfill.

Electrical-Mechanical Shop

The only significant waste materials produced from the Electrical-Mechanical Shop (Bldgs. 228 and 229) are lube oil (30 gal/yr) and PCB transformers (variable). Waste lube oil has been contract disposed since 1970. Since 1982, PCB-containing transformers have been disposed of through DPDO. Handling, storage, and disposal of PCB items are described in Sec. 4.1.4.

Heating and Air Conditioning Shop

The Heating and Air Conditioning Shop (Bldgs. 228 and 229) generates wastewater contaminated with diesel fuel and fuel sludge (120 gal/yr). This material has been contract disposed since 1970.

Water Treatment

Cooling Towers--The cooling towers (located throughout LAAFS) through normal operations primarily generate corrosion inhibitor (1,700 gal/yr) and coil cleaner (variable). Since 1978, the corrosion inhibitor used at LAAFS usually has been a mixture of sodium dichromate dihydrate, polytriazide, sodium hydroxide, biocide such as calcium hypochlorite,

and methylene bis-thiocyanate. Prior to 1978, chromic and phosphoric acids were included in the corrosion inhibitor. The coil cleaner is diluted sulfuric acid. Corrosion inhibitor has been used since 1955 and coil cleaner since 1963. These wastes always have been discharged to the sanitary sewer. Corrosion inhibitor has been diluted prior to discharge.

Steam Boilers--Steam boilers (Bldgs. 120 and 241) generate blowdown (2,200 gal/yr) which contains small concentrations of antifoaming agent and dispersant (sodium hexametaphosphate, sodium sulfide, sodium hydroxide, and cyclohexamine tannin). Blowdown has been discharged to the sanitary sewer since 1955.

Chillers and Hot-Water Boilers--The chillers and hot-water boilers (located basewide) use varying amounts of sodium nitrate, sodium nitrite, and borate as corrosion inhibitor. Since 1955, corrosion inhibitor has been discharged to the sanitary sewer during blowdowns.

Water Softeners--The water softeners (Bldgs. 120, 130, and 241) generate approximately 1.3 million gallons of softener backwash (sodium chloride solution) annually. Backwash has been discharged to the sanitary sewer since the early 1950s by both Douglas Aircraft Co. (until 1962) and USAF (since 1962).

Facilities Engineering

Facilities Engineering (Bldg. 229) wastes include solid waste and sanitary sewage (both in varying quantities). Since 1962, solid waste (mostly office refuse) has been hauled to an offbase sanitary landfill by contractors. Sanitary sewage always has been discharged to the regional sewage collection system for treatment.

RECREATION SERVICES BRANCH

Auto Hobby Shop

The Auto Hobby Shop (Bldg. 215) generates waste lube oil and solvent (1,100 gal/yr), brake linings (variable), and aircraft-cleaning compound (2,000 gal/yr). Since 1963, the waste lube oil and solvent

(mostly carburetor cleaner and Stoddard solvent) have been contract disposed, brake linings have been hauled to an offbase sanitary landfill with other shop refuse, and the aircraft-cleaning compound has been discharged to the sanitary sewer.

The Auto Hobby Shop also operates a vehicle wash facility (Bldg. 214). This facility was constructed in 1982. Wastewater is discharged to a clarifier for removal of oil, grease, and solids prior to discharge to the sanitary sewer system. Sludges that are removed from the periodic cleanout of the clarifier are contract disposed.

TRANSPORTATION BRANCH

Vehicle Maintenance

Onbase vehicle maintenance (Bldgs. 219 and 250) has been contracted to DEL-JEN, Inc. since 1978. Prior to 1978, vehicle maintenance was performed by USAF personnel. Waste types and quantities during that time were reportedly similar to current waste types and quantities. Waste generation includes lube oil (110 gal/yr), brake linings (up to 12 linings/yr), brake dust (variable but small quantity), and vehicle wash wastewater containing detergent (variable quantity). Since 1963, waste lube oil has been contract disposed, brake linings and batteries have been returned to the supplier, brake dust has been hauled to an offbase sanitary landfill. Vehicle wash wastewater is discharged to the storm drain from washing activities that occur adjacent to Bldg. 219.

Reprographics Branch

Reprographics (Bldg. 244) generates a varying amount of solvent-contaminated rags. From 1975 to 1983, these rags were returned to the supplier for cleaning or disposal. Since 1983, the rags have been hauled to an offbase landfill.

4.1.1.2 TENANTS

2080TH COMMUNICATIONS SQUADRON

Waste generation from the 2080th Communications Squadron (Bldg. 130) is limited to spent mercury batteries (40/yr). These batteries have been contract disposed since they were first used in 1984.

BASE EXCHANGE SERVICE STATION

The Base Exchange (BX) Service Station (Bldg. 235) generates waste lube oil and oil/water separator wastes (2,400 gal/yr), solvent (200 gal/yr), and automotive batteries, brake linings, and brake dust (variable quantities). Since 1970, waste oil and solvent have been contract disposed, spent automotive batteries and brake linings have been returned to the supplier, and brake dust has been hauled to an offbase sanitary landfill.

4.1.2 LABORATORY OPERATIONS

Laboratory operations at LAAFS are performed by the 6592d Air Base Group, USAF Clinic, Det. 13--1369th Audiovisual Squadron (AVS), and Aerospace Corp. research laboratories. STL worked at LAAFS until 1960, when replaced by Aerospace Corp. Operations of these laboratories are described in the following paragraphs and in Table 4.1-2.

6592D AIR BASE GROUP WATER ANALYSIS LABORATORY

The Water Analysis Laboratory (Bldg. 229) generates varying amounts of waste chemicals used in alkalinity, hardness, and total dissolved solids testing. Since 1954, the waste materials have been discharged to the sanitary sewer.

USAF CLINIC

The USAF Clinic has been located in Bldg. 200 since moving from offbase facilities in 1980. The Clinic operates two waste-generating laboratories--the Dental Laboratory and the Medical X-Ray Laboratory. The major wastes generated by the Dental Laboratory are waste isopropyl

Table 4.1-2. Los Angeles AFS Laboratory Operations--Waste Generation

Laboratory Name	Location (Bldg. No.)	Waste Material	Waste Quantity (lb/yr)*	Waste Management Practices (1955 1960 1965 1970 1975 1980)
I. 6592D AIR BASE GROUP				
A. Water Analysis Lab	229	Various chemicals for testing hardness, alkalinity, and TDS	Variable	Discharged to sanitary sewer
II. USAF CLINIC				
A. Dental Lab	200	Isopropyl alcohol	50 gal/yr	Discharged to sanitary sewer
		Photographic solutions (fixer and developer)	30 gal/yr	Silver recovery offbase
		Sterilizing agent (25% formaldehyde, 75% ethyl alcohol)	25 gal/yr	Discharged to sanitary sewer
		Amalgam (a silver, mercury, nickel, and copper alloy)	Variable	Precious metals recovery offbase
B. Medical X-Ray Lab	200	Developer/replenisher	240 gal/yr	Silver recovery offbase
		Fixer	240 gal/yr	Silver recovery offbase
III. DET. 13--1369TH AVS	130	Film	75-100	Silver recovery offbase
		Developer	260 gal/yr	Discharged to sanitary sewer
		Fixer	260 gal/yr	Silver recovery offbase

Table 4.1-2. Los Angeles AFS Laboratory Operations--Waste Generation (Continued, Page 2 of 6)

Laboratory Name	Location (Bldg. No.)	Waste Material	Waste Quantity (lb/yr)*	Waste Management Practices 1955 1960 1965 1970 1975 1980
III. CONTRACTORS				
A. Space Technology Laboratories	H-1 (west end of Bldg. 130)			
1. Plating Shop		Electroplating wastewater (contained copper, cadmium, cyanide, nickel, iridite, and acid and alkaline solutions)	Unknown	Neutralized and discharged to sanitary sewer
2. Photographic Lab		Developing/ fixing solutions	Unknown	Neutralized and discharged to sanitary sewer
		Rinse water	Unknown	Neutralized and discharged to sanitary sewer
B. Aerospace Corp. Research Laboratories†	130	Resin solution	34	Contract disposal via: Ocean disposal | Offbase landfill
		Hydrochloric acid	3	
		Trichloracetic acid	0.25	
		Hydrofluoric acid	5	
		Chlorosulfonic acid	2	
		Acetic acid	2	
		Laser dye	21.3 gal/yr	
		Lacquer thinner	1 gal/yr	
		Vacuum pump oil	2.75 gal/yr	
		Sulfuric acid	1	
		Nitric acid	1	

Table 4.1-2. Los Angeles AFS Laboratory Operations--Waste Generation (Continued, Page 3 of 6)

Laboratory Name	Location (Bldg. No.)	Waste Material	Waste Quantity (lb/yr)*	Waste Management Practices 1955 – 1960 – 1965 – 1970 – 1975 – 1980
B. Aerospace Corp. Research Laboratories† (Continued)	130	Silane	0.25	Contract disposal via: Ocean disposal (1960–1971) | Offbase landfill (1971–)
		Acetone	9 gal/yr	
		Liquid cement	4 gal/yr	
		Methyl ethyl ketone peroxide	0.12	
		Gasoline	4	
		Ammonium carbonate	3	
		Aluminum, metallic powders	0.25	
		Antimony trichloride solution	1	
		Fluoboric acid	1	
		Sulfuric acid and chromic acid solutions	1 gal/yr	
		Ammonium persulfate	0.5	
		Asbestos-cement pipe	25	
		Chromium trioxide	0.5	
		Tungston trioxide	0.5	
		Cyanide	0.12	

Table 4.1-2. Los Angeles AFS Laboratory Operations--Waste Generation (Continued, Page 4 of 6)

Laboratory Name	Location (Bldg. No.)	Waste Material	Waste Quantity (lb/yr)*	Waste Management Practices 1955 1960 1965 1970 1975 1980
B. Aerospace Corp. Research Laboratories† (Continued)	130	1% Nitrocellulose in amyl acetate	0.25	Contract disposal via: Ocean disposal (ca. 1960–1972); Offbase landfill (ca. 1972 onward)
		Nitrobenzene	1	
		M-Terphenyl	2.2	
		Laser-dye-contaminated trash	10	
		Asbestos	11	
		Barium fluoride	1	
		Barium chloride	2	
		Potassium ferrocyanide	1	
		2-Biphenyl isocyanate	0.22	
		3,3-Dimethoxy-4,4-biphenyl diisocyanate	0.22	
		Toluene	1 gal/yr	
		Methyl methacrylate	6.6	
		2-Methylbutane	0.25 gal/yr	
		Bromobenzene	1 gal/yr	
		Xylene	1.12 gal/yr	
		1,2-Dimetrozyethane	1 gal/yr	
		Pyridine	2	
		Methyl acetate	1	

Table 4.1-2. Los Angeles AFS Laboratory Operations--Waste Generation (Continued, Page 5 of 6)

Laboratory Name	Location (Bldg. No.)	Waste Material	Waste Quantity (lb/yr)*	Waste Management Practices 1955 1960 1965 1970 1975 1980
B. Aerospace Corp. Research Laboratories† (Continued)	130	Chloroform	4	Contract disposal via: Ocean disposal | Offbase landfill
		Methyl alcohol	0.12 gal/yr	
		Hydrazine-contaminated trash	10	
		Lithium metal	6	
		Potassium dichromate	5	
		Potassium chlorate	1	
		Lead nitrate	2	
		Hydrogen peroxide	1	
		Perchloric acid	0.12 gal/yr	
		Ethyl alcohol	1 gal/yr	
		1,2,4-Trimethylbenzene	2.2	
		2-Methyl cyclohexanol	2	
		Phenol	1	
		Calcium hypochlorite	10	

Table 4.1-2. Los Angeles AFS Laboratory Operations--Waste Generation (Continued, Page 6 of 5)

Laboratory Name	Location (Bldg. No.)	Waste Material	Waste Quantity (lb/yr)*	Waste Management Practices 1955 1960 1965 1970 1975 1980
B. Aerospace Corp. Research Laboratories† (Continued)	130	Arsenic-contaminated trash	1	Contract disposal via:
		Mercury-contaminated trash	3	Ocean disposal (1960–1972); Offbase landfill (1972→)
		Freon	0.75 gal/yr	
		Dilute acidic laboratory wastewater	1-2 gal/min	Diluted and discharged to sanitary sewer (1955–1978); Neutralized prior to discharge to sanitary sewer (1978→)
		Hydrogen fluoride (gas) sulfur dioxide (gas)	Variable	Vented to atmosphere or scrubbed with water to sanitary sewer
		Hydrofluoric and sulfuric acid wastewater	Variable	Neutralized prior to discharge to sanitary sewer (1977→)

*Unit of measurement is pounds per year (lb/yr) unless indicated otherwise.
†Waste types and generation rates from a research and development lab change regularly; "typical" waste types and quantities are listed.

Key:

——— Confirmed timeframe and disposal data from shop personnel.
------ Estimated timeframe and disposal data from shop personnel.
———► Arrow indicates current practice at time of site visit.

TDS = Total dissolved solids.

Source: ESE, 1985.

alcohol (50 gal/yr), photographic solutions (30 gal/yr), sterilizing agent (25 gal/yr), and varying amounts of amalgam (a silver, mercury, nickel, and copper alloy). Since 1980, the waste photographic solutions have been shipped offbase for silver recovery, the alcohol and sterilizing agent have been discharged to the sanitary sewer, and the amalgam is turned in to Supply for recovery of precious metals.

Waste generation from the Medical X-Ray Laboratory includes spent developer/replenisher (240 gal/yr) and fixer (240 gal/yr). Since 1980, these materials are included with waste photographic solutions from the Dental Laboratory for silver recovery offbase.

DET. 13--1369TH AUDIOVISUAL SQUADRON

The 1369th Audiovisual Squadron (AVS) operates a Photographic Laboratory for the processing of black-and-white and color print film. The laboratory has been located in Bldg. 130 since 1968. Waste generation consists of film scrap [75 to 100 pounds (lb)/yr)], developer (260 gal/yr), and fixer (260 gal/yr). Since 1968, film scrap and fixer have been shipped offbase for silver recovery, and developer solution has been discharged to the sanitary sewer.

SPACE TECHNOLOGY LABORATORIES

STL operated a metals plating shop and a photographic laboratory in Bldg. H-1 (the west end of Bldg. 130) from 1957 to 1960, when replaced by the Aerospace Corp. research laboratories.

Plating operations generated electroplating wastewater containing copper, cadmium, cyanide, nickel, iridite, and acid and alkaline solutions. Wastewater collected in the plating shop sewers was neutralized in a basin on the west side of Bldg. 130 prior to discharge to the regional sanitary sewer system. This operation ceased in 1960.

Solids from the neutralization basin were not removed for disposal. Solids that accumulated in the basin were carried over into the sanitary

sewer system by the wastewater flow. At the time of the site visit, an inspection of the basin indicated that there was no flow through the system. The possibility exists that contaminated solids may remain in the basin from the previous plating activities.

The Photographic Laboratory was located adjacent to the Plating Shop in Bldg. 130. Wastes produced from normal activity included developing and fixing solutions and rinse water. These wastes were neutralized and discharged to the sanitary sewer. Historical records did not contain information on the quantities of wastewater generated from the STL Plating Shop and Photographic Laboratory activities.

AEROSPACE CORPORATION RESEARCH LABORATORIES

The Aerospace Corp. operates several laser research and development laboratories throughout Bldg. 130. Waste types and generation rates from a research and development laboratory change regularly as required by specific projects. Therefore, the waste materials listed in Table 4.1-2 are noted as being "typical." The waste types and quantities listed in Table 4.1-2 are from the LAAFS Hazardous Waste Management Plan (AFSC, 1983) and recent hazardous waste manifests (Aerospace Corp., 1984). Disposal of the Aerospace Corp. laboratory wastes has been by contract disposal since operation startup in 1960. Specifically, ocean disposal was used from 1960 to 1973 and offbase landfilling from 1973 to present. Following enactment of state and Federal toxic substances and hazardous waste regulations in the late 1970s [e.g., the California Hazardous Waste Control Law, the Toxic Substances Control Act (TSCA) and RCRA], materials classified as toxic or hazardous have been disposed of by hazardous waste contractors at approved hazardous waste disposal sites. Hazardous waste manifests for these materials are on file with the LAAFS Civil Engineering Division.

In 1983, a neutralizer was installed at the east end of Bldg. 130 for the neutralization of acidic laboratory wastes drained to dedicated laboratory sinks and floor drains throughout Bldg. 130. Caustic is used

as the neutralizing agent. A pH probe and automatic caustic feeder ensures that all wastewaters are neutralized before being discharged to the sanitary sewer. The wastewater flow averages 1 to 2 gal/min.

Variable quantities of hydrogen fluoride and sulfur dioxide gases are generated by the laser research laboratories. From 1968 to 1978, these gases either were vented to the atmosphere or were scrubbed with water, and the resulting scrubber wastewater was discharged to the sanitary sewer system. In 1978, a neutralizer was installed at the east end of Bldg. 130. This neutralizer was installed to neutralize the acidic scrubber wastewater containing hydrofluoric and sulfuric acids produced by the reaction of hydrogen fluoride and sulfur dioxide with water. This neutralizer is a 2-staged, closed-loop system using potassium hydroxide as the neutralizing agent. Periodic blowdown of the pH 7 wastewater is discharged to the laboratory waste neutralizer for additional treatment before discharge to the sanitary sewer.

4.1.3 PESTICIDE HANDLING, STORAGE, AND DISPOSAL

Pesticides are used on LAAFS by Pacifica Services, Inc. Facilities Engineering to maintain grounds and structures and to prevent pest-related problems. Previous contractors responsible for pest control at LAAFS were Trend Western Technical Corp. (1979 to 1984), Action Industries (1971 to 1979), TECDATA (1969 to 1971), and TUMPANE (1966 to 1969). Available records did not contain information on entomological activities of the Douglas Aircraft Co., which operated in the Navy-owned facilities on Area B prior to 1962.

Pesticide formulations have been stored in Bldg. 229 and in the storage area at the east end of Area A. A pesticide inventory for LAAFS is presented in Table 4.1-3.

Pest-control operations generate pesticide-contaminated rinse waters from equipment rinsing, empty pesticide containers, and excess or outdated bulk pesticides. Several methods have been used for disposal of pesticide wastewaters. Prior to 1975, pesticide equipment rinse

Table 4.1-3. LAAFS Pesticide Inventory

Insecticides	Herbicides
Vaponite (Dichlorous)	Sevimol 4
Ficam-W	Diazinon 5
Ficam-D	Controlled foam surfactant
Diazinon	Lindane
Diazinon 260	Diquat
Killmaster-II®	Round-up®
Malathion	Princep
Millspray (Pyrethrins)	
Baygon®	
Roach Prufe®	
Allethrin	
Avitrol	
Warfarin	
Bait Pellets (Diphacinone)	
Cygon 2-E	

Sources: AFSC, 1982.
ESE, 1985.

waters were discharged to a dedicated drain in the pesticide storage area. This drain line (approximately 18 ft long) drained to the railroad right-of-way located south of Area A. Empty pesticide containers were included with building refuse for disposal in an offbase sanitary landfill.

Since 1975, rinse waters have been applied as pesticides, accumulated and used as diluent for preparation of subsequent formulations, or contract disposed as hazardous wastes.

From 1975 to 1982, pesticide containers were triple rinsed and crushed before being disposed of in an offbase sanitary landfill.

Since 1982, unrinsed bulk pesticide containers (average 6/yr) have been accumulated at Bldg. 228 for disposal with other hazardous wastes. For the same time period, unrinsed Ficam foil packs (emptied, premeasured insecticide packets) have been included with the general solid waste for disposal in a sanitary landfill. Available records indicate that excess or outdated pesticides have been disposed of by offbase contractors or by the U.S. Department of Agriculture.

Pesticides for home and lawn use are stored and sold at the BX (Bldg. 251). These items are not used for onbase pest-control purposes. In early 1985, it was reported that pesticide items in the BX that were outdated or exceeded shelf life were disposed of by dumping into a storm drain catch basin located south of Bldg. 244. This disposal practice, which occurred infrequently and involved only small quantities of pesticides, was stopped in February 1985 when the base Civil Engineering Division was notified. Sediments in the catch basin were removed by the base engineers and contract disposed as hazardous wastes. A subsequent water sample taken downgradient of the catch basin was analyzed and found to contain 0.16 mg/l of the herbicide 2,4-dichlorophenoxyacetic acid (2,4-D).

4.1.4 PCB HANDLING, STORAGE, AND DISPOSAL

The LAAFS electrical equipment and distribution system is currently maintained by Pacifica Services, Inc. Past operating contractors responsible for electrical equipment maintenance were Trend Western Technical Corp. (1979 to 1984), Action Industries (1971 to 1979), TECDATA (1969 to 1971), and TUMPANE (1966 to 1969). Minor transformer repairs and routine maintenance of the distribution system, poles, and street lights have been performed by the operating contractors. Major transformer repairs have been performed by offbase contractors. Since 1962, only PCB transformers have been taken out of service at LAAFS. In 1984, three PCB transformers were removed and sent to the DPDO for disposal. A list of PCB transformers still in service at LAAFS is presented in Table 4.1-4. On Feb. 12, 1982, a small PCB spill ($\leq$10 ounces) was discovered in the basement of Bldg. 115 East. The spill was cleaned up on Feb. 21, 1982. All contaminated materials were placed in containers and disposed of in a hazardous waste landfill.

4.1.5 POL HANDLING, STORAGE, AND DISPOSAL

The types of POL used and stored at LAAFS include motor gasoline (MOGAS), diesel fuel (DF-2), kerosene, liquified petroleum gas (LPG), petroleum-based solvents, hydraulic fluid, and lube oil.

In addition to fixed storage tanks, 55-gal drums and smaller containers are used for aboveground storage of incoming and waste materials, mainly solvents, hydraulic fluid, and lube oil.

POL spill management is addressed in the USAF Oil/Hazardous Substance Contingency Plan. This plan is revised regularly to ensure that it accurately reflects storage capacity and spill prevention/containment.

<u>Existing Aboveground POL Storage</u>

Three existing aboveground storage tanks were identified at LAAFS. All three tanks are 500-gal MOGAS storage tanks with dikes for spill containment.

Table 4.1-4. In-Service PCB Transformers

Building	Volume (gal)	Manufacturers
100 (North)	485	ESCO Manufacturing Co.
100 (South)	485	ESCO Manufacturing Co.
105 (West)	420	Wagner Electric Corp.
105 (East)	265	Wagner Electric Corp.
110 (North)	485	ESCO Manufacturing Co.
110 (South)	485	ESCO Manufacturing Co.
115 (East)	485	ESCO Manufacturing Co.
115 (West)	485	ESCO Manufacturing Co.
115 (South at roof)	135	Wagner Electric Co.
120 (East)	394	Erie Electric Co.
120 (West)	394	Erie Electric Co.
125 (East)	435	Wagner Electric Co.
125 (West)	435	Wagner Electric Co.
130 (East)	485	ESCO Manufacturing Co.
130 (West)	485	ESCO Manufacturing Co.
130 (South)	110	Sierra Transformer Co.
239 (Substation 1)	Unknown	General Electric
200 (Substation 2)	637	Westinghouse
220 (Substation 3)	425	General Electric
220 (Substation 4)	425	General Electric
240 (Substation 5)	375	General Electric
243 (Substation 6)	375	General Electric

Sources: AFSC, 1980b.
LAAFS, 1985.
ESE, 1985.

Existing Underground POL Storage

A total of 19 existing underground storage tanks were identified at LAAFS, with a total capacity of 88,000 gal. The locations, POL types, capacities, and containment structures are listed in Table 4.1-5. Most of the large underground tanks are used for storing MOGAS for vehicular use and DF-2 for backup building heater fuel.

Abandoned Underground POL Storage

One abandoned underground tank was identified at LAAFS. In 1977, a tank containing No. 2 fuel oil located in the southwest corner of Area A near the security guard station was discovered to be leaking. According to inventory records, approximately 25,800 gal of fuel oil had leaked from the tank. The remaining contents of the tank were removed, and the tank was subsequently filled with sand and capped (see Sec. 4.2.3 for more details). No additional remedial measures were reported.

Waste POL Storage, Handling, and Disposal

Waste POL at LAAFS includes waste fuel, lube oil, petroleum-based solvents, and hydraulic fluid. The generation and disposal of waste POL are summarized in Table 4.1-1 (in Sec. 4.1.1). Wastes are accumulated at their generation points in 55-gal drums, smaller containers, aboveground tanks, and underground tanks until the maximum capacity is reached. Since 1962, the typical disposal practice for waste POL has been contract disposal by offbase recovery/recycling companies. Available records do not indicate any onsite POL disposal, such as landfilling, landspreading, or burning.

4.1.6 RADIOACTIVE MATERIAL HANDLING, STORAGE, AND DISPOSAL

Various types of items containing radioactive materials are stored and used at LAAFS, including sealed calibration sources, analytical instrumentation, and luminous dials. Most of these radioactive materials are used and stored by Aerospace Corp. in Bldg. 130 in support of the Van de Graaft accelerator.

Table 4.1-5. Existing Underground POL Storage Facilities

POL Type	Capacity (gal)	Facility	Protection Measures
DF-2	3,000	100	UG*
DF-2	3,400	105	UG
DF-2	3,000	110	UG
DF-2	3,000	115	UG
DF-2	3,400	120	UG
DF-2	3,400	125	UG
DF-2	4,600	130	UG
DF-2	1,500	200	UG
DF-2	2,000	200	UG
DF-2	3,500	200	UG
Waste oil	Unknown	215	UG
DF-2	2,000	220	UG
DF-2	14,500	220	UG
MOGAS	10,000	235	UG
MOGAS	10,000	235	UG
MOGAS	10,000	235	UG
Waste oil	Unknown	235	UG
DF-2	10,000	241	UG
MOGAS	100	241	UG

*UG = underground.

Sources: AFSC, 1984a.
ESE, 1985.

An inventory of radiological sources, quantities, storage and use locations, and license authorization is maintained by the Aerospace Corp. Safety Engineer.

Since 1960, disposal of all radioactive materials has been through contract with offbase companies, specifically by ocean disposal prior to 1973 and burial in a licensed radioactive material disposal site since 1973. Available records do not indicate that any radioactive materials have been disposed of on LAAFS.

4.1.7 EXPLOSIVE/REACTIVE MATERIALS HANDLING, STORAGE, AND DISPOSAL

The only explosive or reactive material used and stored at LAAFS, other than small-caliber ammunition for the security police, was aircraft munitions. These munitions were stored in a bunker in Area B (Bldg. 221) and were used to sight wing guns on aircraft being manufactured by the Douglas Aircraft Co. from 1954 to 1962. The bunker has not been used to store munitions since 1962. According to available information, no explosive or reactive materials have been disposed of at LAAFS.

4.2 WASTE DISPOSAL METHODS AND DISPOSAL SITE IDENTIFICATION, EVALUATION, AND HAZARD ASSESSMENT

As described in the current and past activity review (Sec. 4.1), various methods have been used for disposal of wastes generated by LAAFS operations. Because of the small size and urban location of LAAFS, no large-scale onsite disposal methods (such as landfilling, burning, or landspreading) have been used. Depending on type, wastes have either been transported offsite to municipal landfills, contract disposed by ocean disposal or offsite landfilling, or discharged to the regional sanitary sewer system or flood control district storm drainage system. In each of these cases, the wastes are ultimately transported offsite leaving little or no potential for onsite contamination. A fuel spill site and a chemical (pesticide) disposal site were identified as having potential for contamination.

4.2.1 SANITARY AND STORMWATER DRAINAGE DISPOSAL SITES

One sanitary drain disposal site (SD-1) and two stormwater drainage disposal sites (SD-2 and SD-3) were identified on LAAFS. Site descriptions, designations used in this report, dates of operation, and waste descriptions are listed in Table 4.2-1. The locations of these sites are shown in Figs. 4.2-1 and 4.2-2.

The site designated SD-1 (Fig. 4.2-1) is the neutralization basin used from 1957 to 1960 for the disposal of wastes generated from the former STL Plating Shop and Photographic Laboratory. Wastes generated from plating operations consisted of electroplating wastewater containing copper, cadmium, cyanide, nickel, iridite, and acid and alkaline solutions. Wastewater generated in the Plating Shop and Photographic Laboratory (spent developing and fixing solutions) was neutralized in a basin located at the west end of Bldg. 130 (Fig. 4.2-1) prior to discharge to the municipal sanitary sewer system. Reportedly, no sludges were removed from this basin. Since it is unknown if any sludges remain in the basin or the extent to which any residual contamination remains, an investigation of this former neutralization system should be conducted under the Base Environmental Program.

The site designated SD-2 (Fig. 4.2-2) is a stormwater drainage catch basin located south of Bldg. 244. This stormwater drain was formerly used to dispose of outdated pesticides from the BX. Subsequent to the site visit, sediments were removed from the catch basin and contract disposed as hazardous wastes. Because of this cleanup and the flushing and dilution in the stormwater drainage system, residual contamination at this site is minimal.

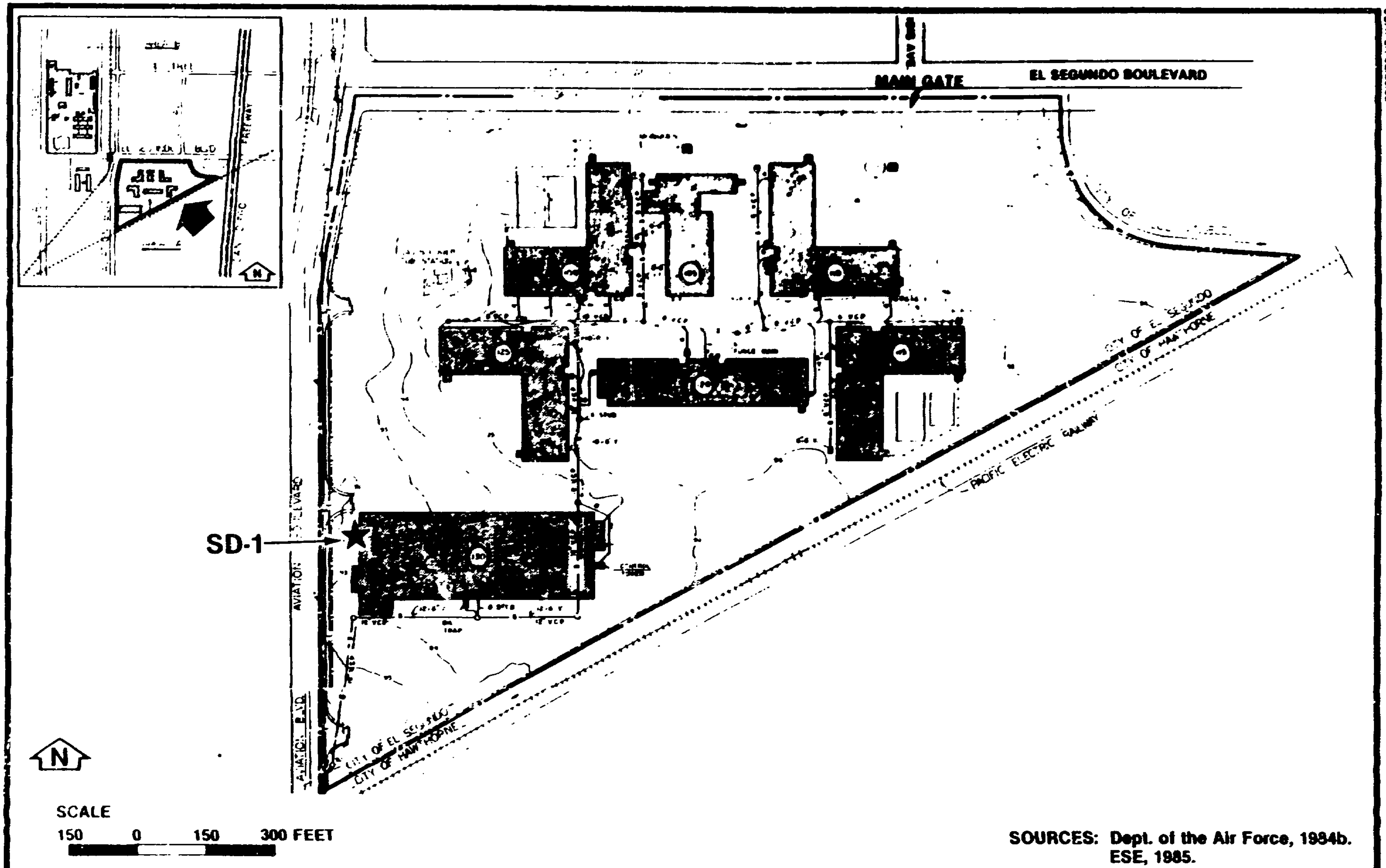
The site designated SD-3 (Fig. 4.2-2) is a vehicle wash area adjacent to Bldg. 219 used by the base Transportation Branch. Vehicle wash wastewater contains detergent surfactants, oil, and grease. This washwater drains into the stormwater drainage system. Because of dilution and flushing in the stormwater system, residual contamination

Table 4.2-1. Summary of Information on LAAP Sanitary and Stormwater Drainage Disposal Sites

Site Description*	Designation	Dates of Operation	Waste Description
Bldg. 130, Plating Shop Neutralization Basin	SD-1	[illegible]	Plating shop wastewater containing copper, cadmium, cyanide, [illegible], iridite, and acid and alkaline solutions; spent photo-[illegible]
Bldg. 244, Stormwater Drainage Disposal Site	SD-2	[illegible]	[illegible] pesticide formulations from the [illegible]
Bldg. 219, Stormwater Drainage Disposal Site	SD-3	[illegible]-Present	Vehicle wash wastewater containing detergent surfactants, oil, and grease

*See Figs. 4.2-1 and 4.2-2 for locations of disposal sites.

Source: ESE, 1985.



SOURCES: Dept. of the Air Force, 1984b. ESE, 1985.

Figure 4.2-1
FORMER NEUTRALIZATION BASIN (SD-1)

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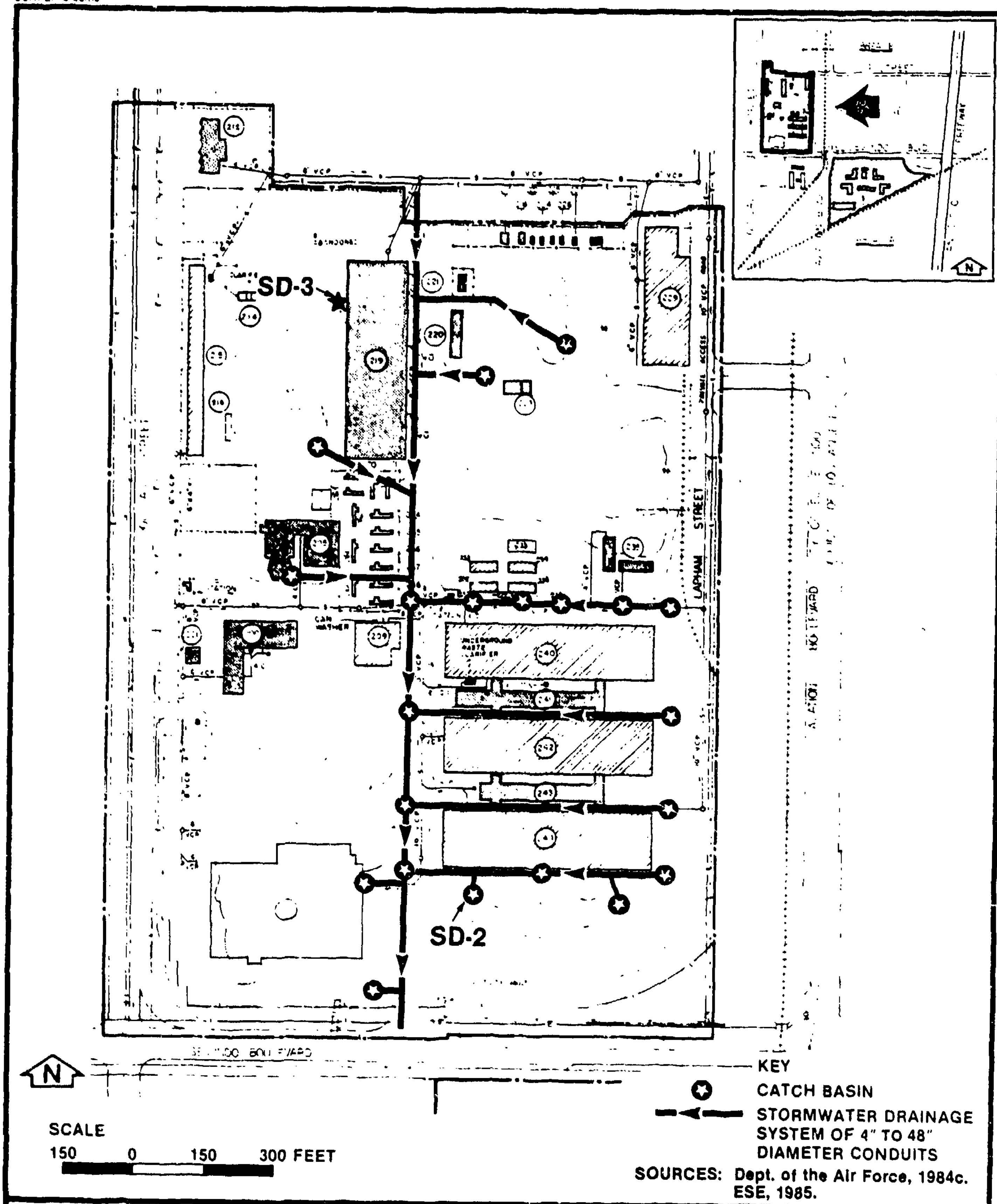

Figure 4.2-2
STORMWATER DRAINAGE DISPOSAL SITES (SD-2 AND SD-3)

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at this site is minimal. Because this is an ongoing operation, a National Pollutant Discharge Elimination System (NPDES) permit may be required.

4.2.2 LANDFILLS

No landfills used for either sanitary or debris disposal were identified at LAAFS. Since USAF acquired LAAFS, all wastes generated at LAAFS have been hauled offbase for disposal.

4.2.3 FUEL SPILL SITE

Records indicate that one major underground POL spill occurred at LAAFS at an underground tank located in the southwest corner of Area A. The spill site is designated FS-1 (Fig. 4.2-3). In November 1977, the base Civil Engineering Division noted a loss of approximately 25,800 gal of No. 2 fuel oil since March 1977, the last time the tank had been filled. Inspection of the tank revealed stress cracks and deformation, although no specific leaks or holes were discovered. The bottom 10 percent of the tank, which contained a mixture of fuel and water, was not inspected for leaks (LAAFS, 1978). The remaining contents of the tank were removed and contract disposed, and the tank was subsequently filled with sand and capped. No additional remedial measures were performed.

In a preliminary hydrogeologic assessment performed by a consultant, it was concluded that the spill would not affect potable ground water usage because (1) a low water table exists beneath LAAFS, and the oil should remain in the unsaturated zone; (2) an impervious confining layer separates the deep potable aquifer; and (3) much of the fuel oil will be degraded by bacteria, and the fuel is lighter than water and may not migrate downward.

The leak of fuel oil has the potential for residual contamination and contaminant migration. A photograph which shows the location of the fuel spill site is presented in App. F.

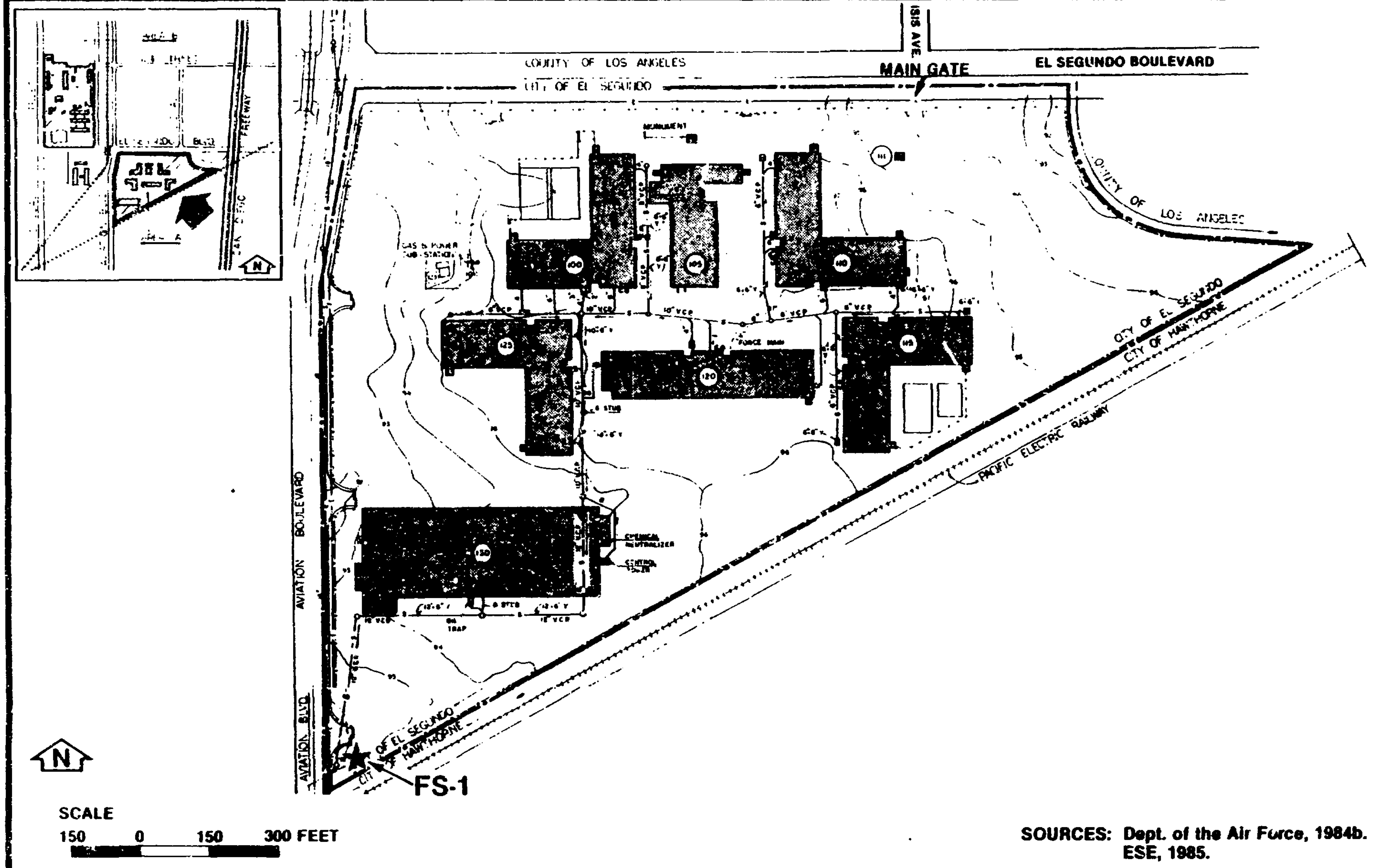

Figure 4.2-3
FUEL SPILL SITE (FS-1)

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4.2.4 FIREFIGHTER TRAINING AREAS

No firefighter training areas were identified at LAAFS. Due to the base mission and relatively small size of LAAFS, no burn pits, smokehouses, or other training facilities have been used by USAF.

4.2.5 PESTICIDE DISPOSAL SITE

Until 1975, pesticide-contaminated wastewater generated by rinsing pesticide application equipment was discharged to a drain in the pesticide storage area in the extreme eastern end of Area A. This drain line (approximately 18 ft long) drained offbase to the railroad right-of-way located immediately south of the storage area (Fig. 4.2-4). This disposal site is designated DS-1. Since 1975, pesticide rinseates have been reused as diluents for preparation of subsequent formulations or containerized and contract disposed. Because of the regular use of the former drain disposal, the potential exists for pesticide contamination in the soils at the discharge point. A photograph which shows the location of the former pesticide disposal site is presented in App. F.

4.2.6 HAZARD EVALUATION ASSESSMENT

The review of past operation and maintenance functions and past waste management practices at LAAFS has resulted in the identification of five sites that were initially considered areas of concern, with potential for contamination. These sites, described in Secs. 4.2.1 through 4.2.5, were evaluated using the decision process presented in Fig. 1.3-1 (in Sec. 1.3). The results of this decision process are summarized in Table 4.2-2. Three sites were found to have little or no potential for contamination or contaminant migration and were not evaluated using the HARM system. These sites are the neutralization basin (SD-1) and the stormwater drainage disposal sites (SD-2 and SD-3). Operational procedures at two of these sites (SD-1 and SD-3) were deemed to warrant review and modification under the base environmental program. These sites are identified under the column "Refer to Base Environmental Programs" in Table 4.2-2. Specific recommendations for each site are

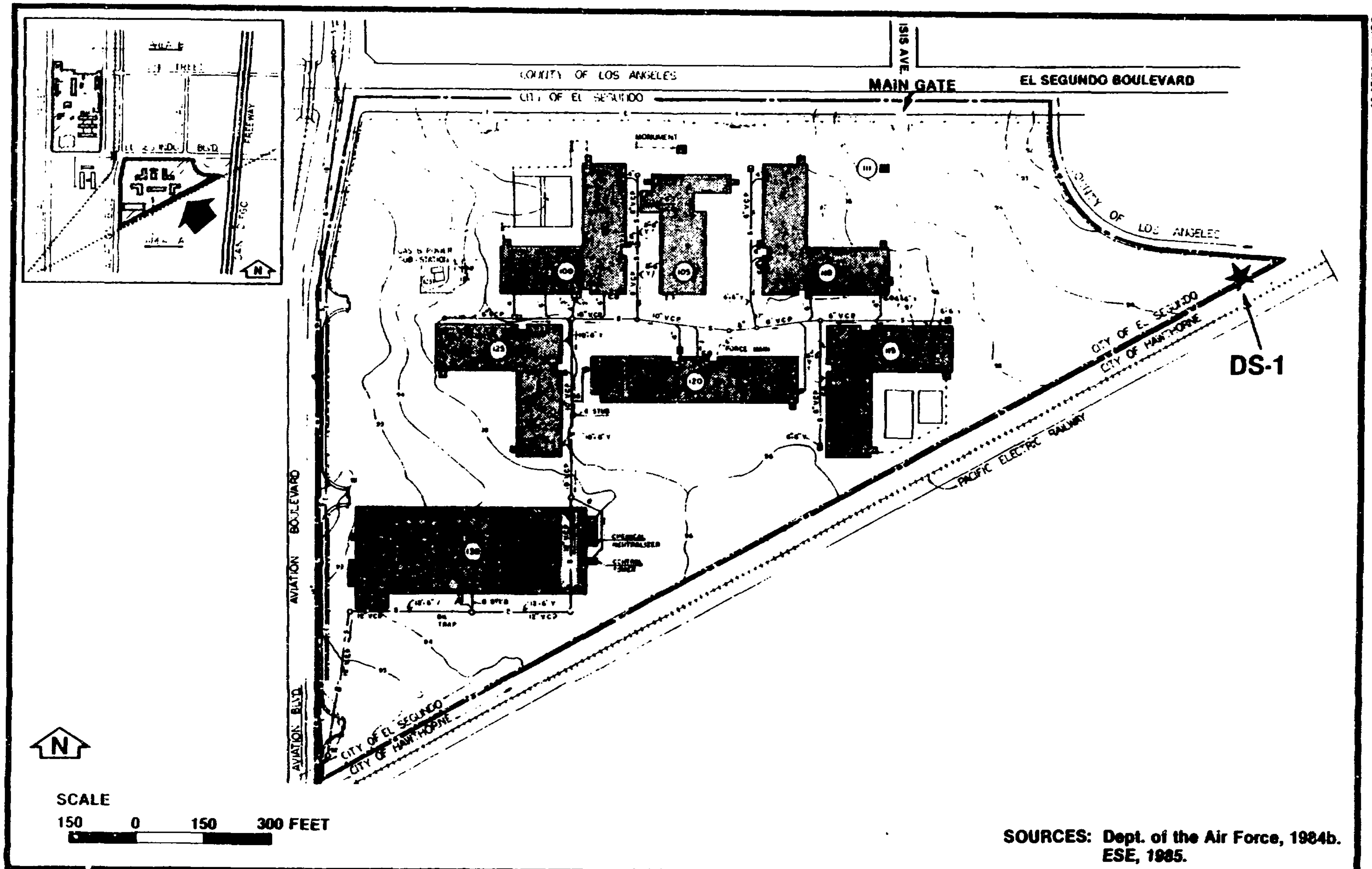

Figure 4.2-4
FORMER PESTICIDE WASTEWATER
DISPOSAL SITE (DS-1)

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Table 4.2-2. Summary of Decision Process Logic for Areas of Initial Environmental Concern at LAAFS

Site Description	Designation	Potential For Contamination	Potential For Contaminant Migration	Potential For Other Environmental Concern*	Refer to Base Environmental Programs	HARM Rating
Bldg. 130, Neutralization Basin	SD-1	Yes	No	No	Yes	No
Bldg. 244, Stormwater Drainage Disposal Site	SD-2	No	No	No	NA†	No
Bldg. 219, Stormwater Drainage Disposal Site	SD-3	No	No	No	Yes	No
Fuel Spill Site	FS-1	Yes	Yes	No	NA	Yes
Chemical Disposal Site	DS-1	Yes	Yes	No	NA	Yes

*Other environmental concerns include environmental problems that are not within the scope of this study (e.g., air pollution, occupational safety requirements).

†NA = Not applicable.

Source: ESE, 1985.

described in Sec. 6.0. The other two sites (FS-1 and DS-1) were found to have potential for contamination and migration of contaminants, and these sites were further evaluated using the HARM system.

The two sites (FS-1 and DS-1) identified in Table 4.2-2 as having contamination and potential for contaminant migration were evaluated using the HARM system. The HARM system includes consideration of potential receptor characteristics, waste characteristics, pathways for migration, and specific site characteristics related to waste management practices. The details of the rating procedure are presented in App. G; results of the assessment are summarized in Table 4.2-3.

The HARM system is designed to indicate the relative need for Phase II action. The information presented in Table 4.2-3 is intended for assigning priorities for further evaluation of the LAAFS spill or disposal sites (Sec. 5.0--Conclusions and Sec. 6.0--Recommendations). The rating forms for the two sites are presented in App. H.

Table 4.2-3. Summary of HARM Scores for Potential Contamination Sources on IAAFS

Rank	Site Description	Designation	Receptor Subscore	Waste Characteristics Subscore	Pathways Subscore	Waste Management Factor	Overall Total Score
1	Fuel Spill Site	FS-1	57	80	43	1.0	60
2	Chemical Disposal Site	DS-1	57	80	42	1.0	59

Source: ESE, 1985.

5.0 CONCLUSIONS

The goal of the IRP Phase I study is to identify sites where there is potential for environmental contamination resulting from past waste disposal practices and to assess the potential for contaminant migration from these sites. The conclusions are based on the assessment of the information collected from the project team's field inspection, review of records and files, review of the environmental setting, and interviews with base personnel, past employees, and state and local government employees.

Five potential contamination sites were identified at LAAFS. The evaluations of those sites are summarized in Table 5.0-1, and Figs. 5.0-1 and 5.0-2 show site locations. Two of the sites (Nos. 4 and 5) are stormwater drainage disposal sites that have little potential for contamination. One site (No. 5) is an operating stormwater drainage disposal site that may require an industrial discharge permit; therefore, this site was determined to warrant review and modification under the Base Environmental Program. Site No. 3 was a former neutralization basin that may contain residual contamination but has no potential for migration. This site was referred to the Base Environmental Program for investigation.

Site Nos. 1 and 2 were determined to have a potential for residual contamination and migration and were assessed using the HARM system. Evaluations and conclusions regarding these two sites are detailed in the following paragraphs.

<u>SITE NO. 1: FUEL SPILL SITE</u>

Inventory control records for the underground fuel storage tank indicated that approximately 25,800 gal of No. 2 fuel oil had been lost from March to November 1977. A tank inspection team from Edwards AFB

Table 5.0-1. Summary of Potential Contamination Sites on LAAFS

Site No.*	Site Description	Report Designation	Date of Operation or Occurrence	Waste Description	Conclusion
1	Underground Fuel Spill Site	FS-1	1977	25,800 gal of No. 2 fuel oil.	Potential for residual contamination and contaminant migration. Received HARM score of 60.
2	Pesticide Disposal Site	DS-1	1960-1975	Pesticide-contaminated wastewater.	Potential for residual contamination and contaminant migration. Received HARM score of 59.
3	Bldg. 130, Plating Shop Neutralization Basin	SD-1	1957-1960	Plating shop wastewater containing copper, cadmium, cyanide, nickel, iridite, and acid and alkaline solutions.	Potential for residual contamination. Refer to Base Environmental Program for sampling. No HARM rating.
4	Bldg. 244, Stormwater Drainage Disposal Site	SD-2	1982-1985	Small quantities of outdated pesticide formulations from the BX.	No potential for residual contamination. Disposal practice ceased. No HARM rating.
5	Bldg. 219, Stormwater Drainage Disposal Site	SD-3	1963-Present	Vehicle wash wastewater containing detergent surfactants, oil and grease.	No potential for residual contamination. Refer to Base Environmental Program for review of operation. No HARM rating.

*See Figs. 5.0-1 and 5.0-2 for site locations.

Source: ESE, 1985.

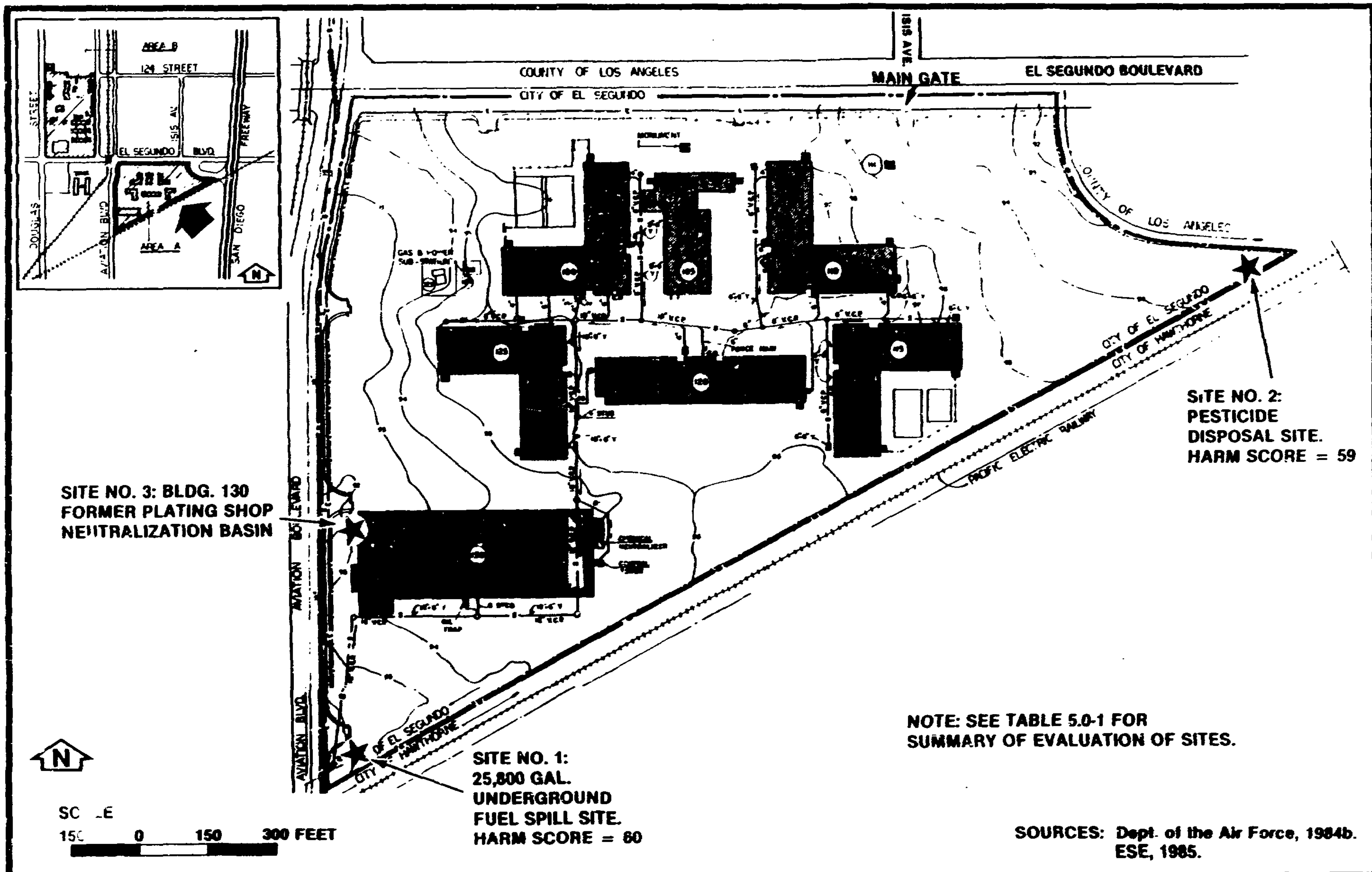

Figure 5.0-1
MAP OF AREA A SHOWING POTENTIAL CONTAMINATION SITES

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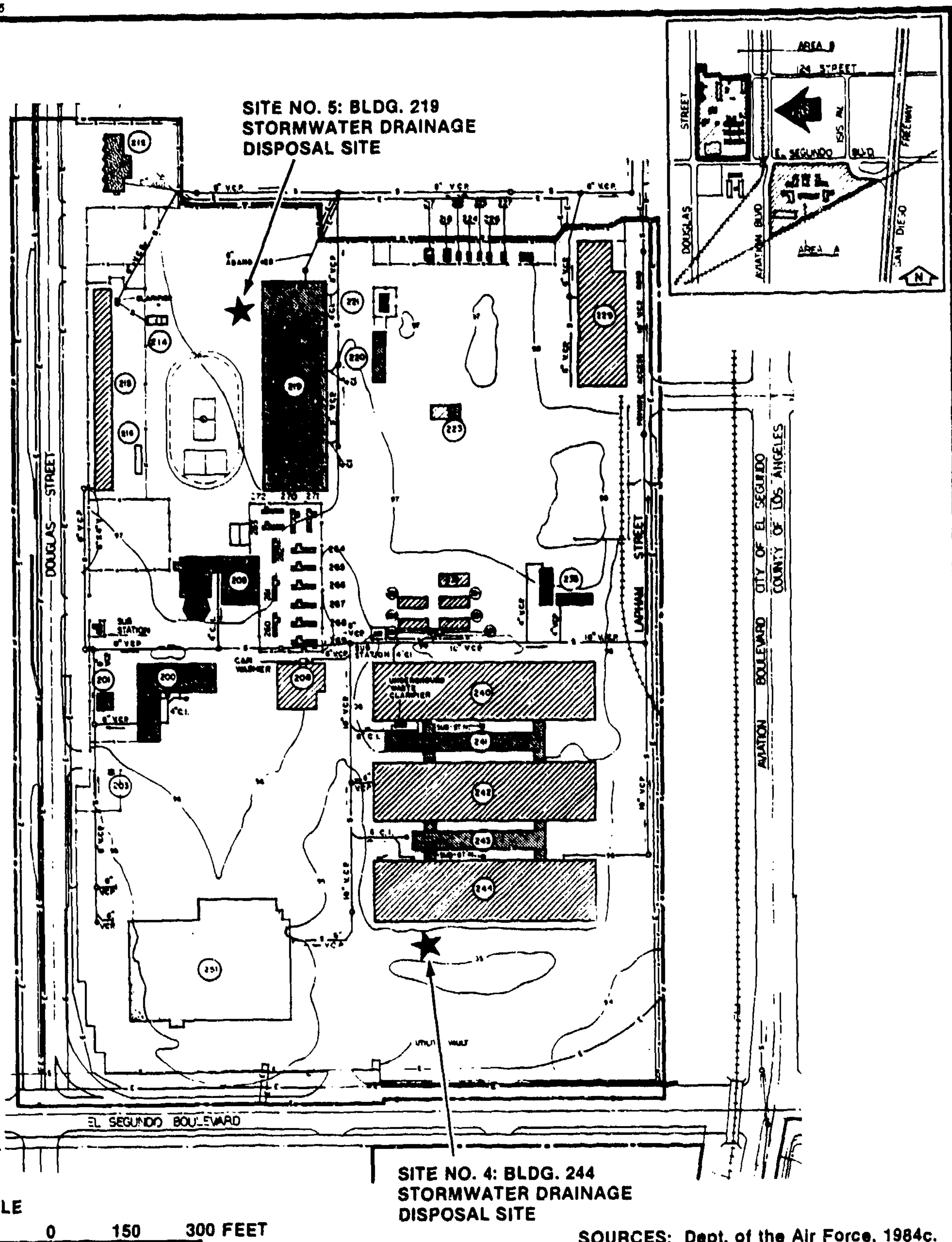

SOURCES: Dept. of the Air Force, 1984c.
ESE, 1985.

Figure 5.0-2
MAP OF AREA B SHOWING
POTENTIAL CONTAMINATION SITES

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visited LAAFS on Dec. 21-23, 1977, and observed that the tank had flattened on the top. At the stress points, discoloration (crazing and stress cracks) were noticed along the full length of the tank. A steel ladder inside of the tank had bowed to one side about 12 inches, indicating a lot of pressure. This pressure would be transmitted to the ties on the tank bottom. A bottom leak was suspected, but 2 ft of fuel and water on the bottom prevented examination of the tank bottom (LAAFS, 1978).

The tank was installed in November 1975 to comply with a USAF directive for a 30-day emergency heating fuel supply on station. It was a 12-ft-diameter by 60-ft-long fiberglass storage tank, sitting on a concrete foundation 14 ft below ground level. The tank walls were 0.41 inch thick, with thicker concentric reinforcing ribs and 9-inch-thick end caps. The fiberglass composition and length made the tank somewhat flexible, which necessitated strict compliance with requirements for fill and compaction around the tank. Reportedly, these requirements were not all known or complied with during the tank's installation. The tank was used only for storage; therefore, there was no piping connected to the tank. Fuel was withdrawn or added from mobile trailer-mounted tanks (LAAFS, 1978). The remaining contents of the tank were removed and contract disposed, and the tank was subsequently filled with sand and capped. No additional remedial measures were performed.

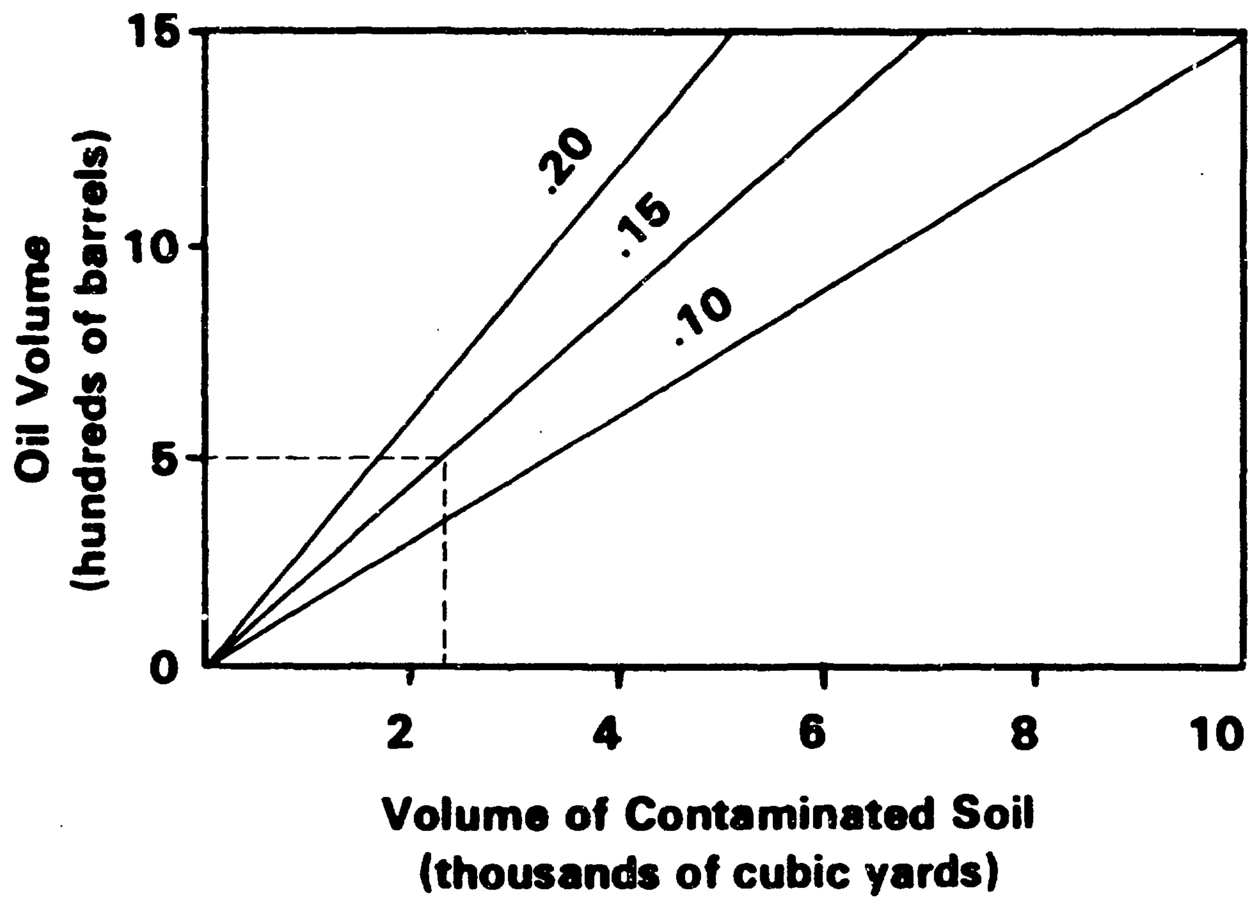
Oil spilled on undisturbed ground migrates downward, under the force of gravity, while spreading laterally to some degree. The rate of movement depends on the viscosity of the oil and permeability of the soil. If the spill area is essentially round, the general shape of the area of passage is a cone, modified by the nature of the soil layers the oil passes through. The downward movement eventually will be interrupted by one of three events: the oil will be exhausted to immobility; it will encounter an impermeable bed; or it will reach the water table.

As oil moves downward through the soil, a small amount attaches itself to each particle of soil contacted and remains behind the main body of oil. Where the spill is small relative to the surface area available for contact in the zone of migration, the body of oil is exhausted on the way down until the degree to which it saturates the soil reaches a relatively low point called the "immobile" or "residual" saturation. At this point the oil essentially stops moving. If the condition develops before the oil reaches the water table, the danger of further contamination is greatly reduced. Subsequent rainfall, percolating through the soil, will carry minor additional amounts of residual oil and dissolved components downward. This situation, however, creates less risk of significant pollution than if the main body of oil reaches the water table.

The volume of soil required to immobilize a given amount of oil depends on two factors: the porosity of the soil and the nature of the hydrocarbon, as reflected by its characteristic "maximum residual saturation." At or below its maximum residual saturation, the oil will not move in the soil. The nomograph shown in Fig. 5.0-3 was developed for a soil porosity of 30 percent, which is typical for the soils underlying LAAFS. The curves cover maximum residual saturations of 0.10 (light oil and gasoline), 0.15 (diesel, light fuel oil), and 0.20 (lube and heavy fuel oil).

The dimensions of the tank [3 yards (yd) wide by 20 yd long] and the approximate depth to the water table (15 to 20 yd) yields a soil volume underlying the tank and above the water table of approximately 1,000 yd^3. As shown in Fig. 5.0-3, however, it would require approximately 2,000 yd^3 to completely immobilize the 500 barrels of fuel oil that had leaked from the tank. Based on this analysis, there is a possibility that some of the fuel oil will encounter the ground water in the surficial sand deposits underlying LAAFS.

USAFLA 02/28/85



SOURCE: API, 1972.

Figure 5.0-3
NOMOGRAPH FOR ESTIMATED VOLUME OF SOIL REQUIRED TO IMMOBILIZE VARIOUS PETROLEUM PRODUCTS

INSTALLATION RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

The City of Hawthorne and the Southern California Water Company operate potable water supply wells within 2 miles of LAAFS. These wells do not pump from the shallow water-table aquifer. They draw water from the deeper Gage, Lynwood, and Silverado Aquifers, which are separated from the shallow water-table aquifer by a series of aquicludes. Because of the confining layers and the sorption of the fuel oil by the soil surfaces, there is little potential for the fuel oil to migrate and contaminate the deeper aquifers that are used for potable supply. The potential does exist, however, for contamination of the shallow water-table aquifer.

The water-table aquifer consists primarily of deposits of silty sand. Based on a topographic gradient of -1 ft per 100 ft toward the west, and assuming a porosity of 30 percent and a hydraulic conductivity of 10^{-3} cm/sec, typical values for silty sand (Freeze and Cherry, 1979), the ground water flow velocity is estimated to be approximately 30 to 40 ft/yr.

Additionally, due to its location in a highly developed area and its proximity to Aviation Blvd., the spilled fuel oil could encounter underground structures such as storm and sanitary sewers. Spilled oil commonly migrates along artificial fills, such as pipeline trenches and utility conduits. Such excavations often are backfilled with material more permeable than that removed. These excavations consequently offer a migration route of minimum resistance, and any fluid will tend to move along them more rapidly than through natural soils. The fuel oil may also accumulate and/or be transported within the underground pipes and manholes and could present a hazard to personnel entering such systems. A photograph which shows the location of this spill site is presented in App. F.

This underground fuel oil spill site received a HARM score of 60.

SITE NO. 2: PESTICIDE DISPOSAL SITE

This disposal site was used from 1960 to 1975 for disposal of pesticide-contaminated wastewater generated by rinsing pesticide application equipment. These wastewaters were discharged into a drain in the pesticide storage area. The drain was connected to an 18-ft-long drain pipe that discharged to the soils at the boundary between LAAFS and the Pacific Electric Railroad right-of-way at the extreme southeastern corner of the installation. Because of the regular use of the former drain for disposal of pesticide-contaminated wastewater, the potential exists for pesticide accumulation in the soil at the discharge point. A photograph which shows the location of this disposal site is presented in App. F.

This site received a HARM score of 59.

6.0 RECOMMENDATIONS

6.1 PHASE II MONITORING RECOMMENDATIONS

Two sites were identified at LAAFS as having potential for environmental contamination, and these sites have been evaluated using the HARM system. The relative potential of the sites for environmental contamination was assessed. Recommendations for Phase II study and monitoring are summarized in Table 6.1-1 and are described in the following paragraphs.

SITE NO. 1: FUEL SPILL SITE

The monitoring program for this site will determine if the fuel oil that leaked from the underground tank has migrated to the surficial watertable aquifer and/or the extent to which the soils underlying the tank have attenuated the fuel. The monitoring program should include the installation of two downgradient monitor wells, one located between the tank and Aviation Blvd. and the other located between the tank and the railroad right-of-way. The slope of the water-table aquifer is anticipated to follow the topographic gradient, which is toward the southwest. One upgradient monitor well should be installed approximately 100 yd east of the tank along the station boundary with the railroad right-of-way. Locations of the recommended monitor wells are shown in Fig. 6.1-1.

Monitoring should be performed on a quarterly basis for 1 year to assess contaminant migration under different precipitation regimes. All monitoring data should be evaluated throughout the program to determine the need for further action (if any).

The monitor wells should be constructed of 2-inch stainless steel casing and screen. Due to the potential organic contaminants of concern, stainless steel is recommended for well construction instead of

Table 6.1-1. Summary of Recommended Monitoring for LAAFS Phase II Investigations

Site No.	Site	Designation	HARM Score	Recommended Monitoring	Remarks
1	Underground Fuel Spill Site	FS-1	60	Install two downgradient and one upgradient monitor wells into the shallow, unconfined aquifer. Monitor for petroleum hydrocarbons and the parameters listed in Table 6.1-2. During well installation, analyze soils for petroleum hydrocarbons as a function of depth.	Continue monitoring if sampling indicates contamination. Additional wells may be necessary to assess extent of contamination.
2	Chemical (Pesticide) Disposal Site	DS-1	59	Sample soils to a depth of 18 to 24 inches. Analyze for pesticides and arsenic, lead, copper, and mercury.	If soils are contaminated, remove and dispose of in accordance with state and Federal regulations.

Source: ESE, 1985.

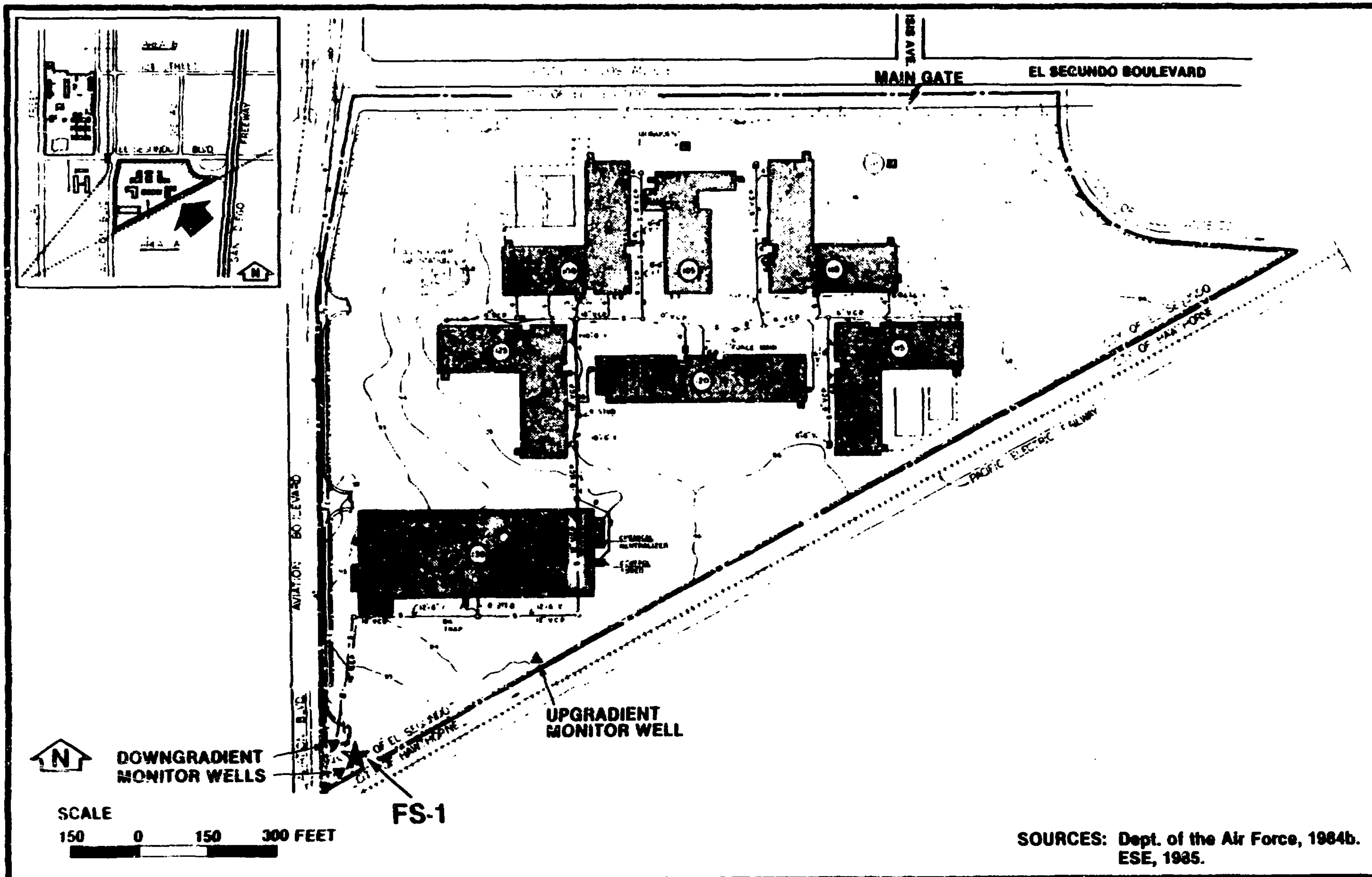


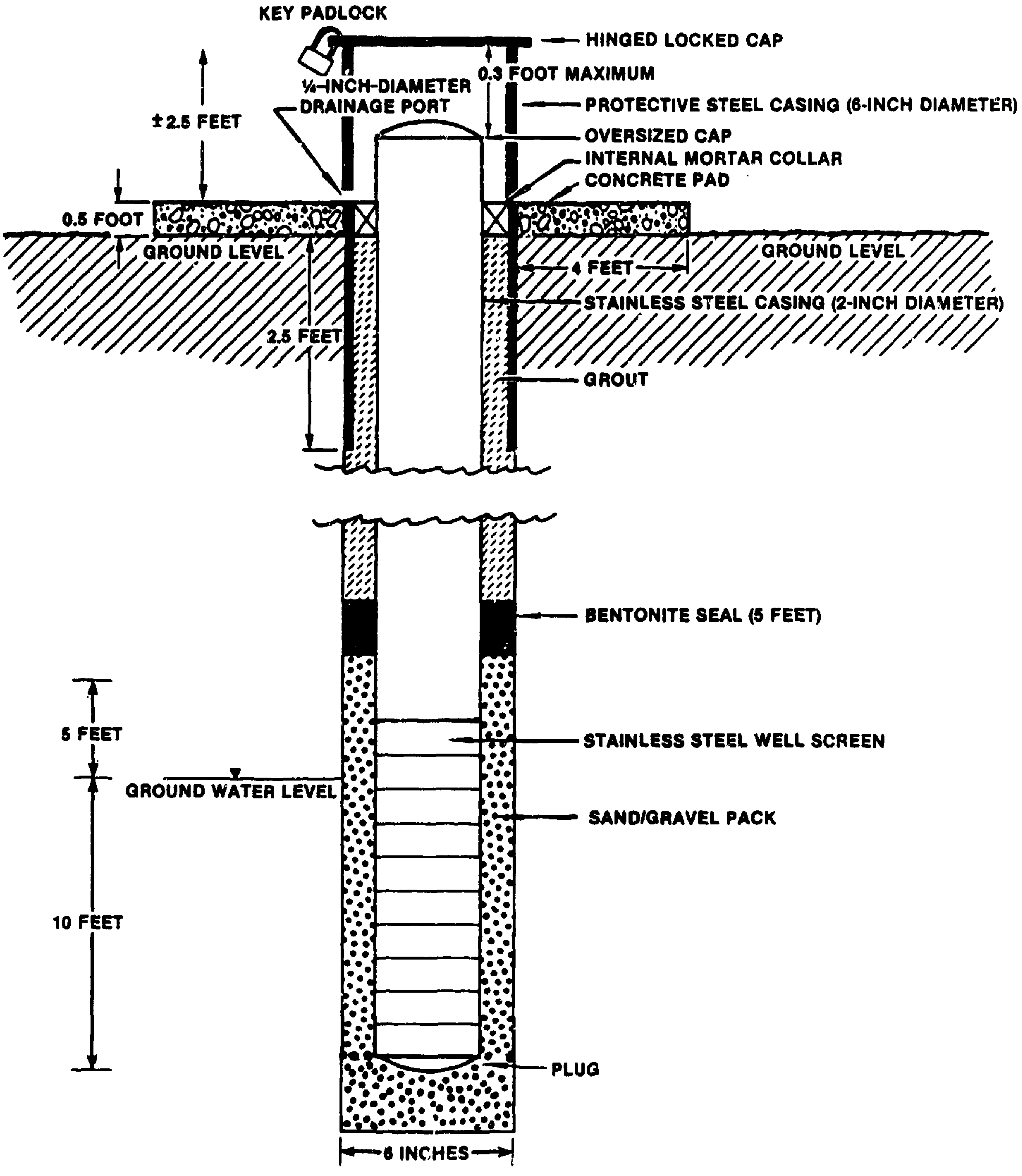
Figure 6.1-1
FUEL SPILL SITE (FS-1) AND LOCATIONS
OF RECOMMENDED MONITOR WELLS

INSTALLATION
RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

polyvinyl chloride (PVC). The monitor wells should be installed such that approximately 10 ft of the screen extends into the saturated interval and approximately 5 ft extends above the water table. The wells need to be screened above the water table to detect the nonmiscible, floating petroleum product contaminant. Fig. 6.1-2 presents the recommended details for monitor well construction. A detailed log of the well borings should be made, including well construction diagrams prepared by a registered geologist. Shelby tube or modified California soil sampler samples collected during drilling should be tested to determine vertical permeability and for the presence of petroleum hydrocarbons. The annulus surrounding the screen should be filled with a filter pack material of medium-fine sand. The top of the filter pack should be bentonite-sealed, and the annulus should be grouted to the surface. The wells should be protected with protective steel casings fitted with locking caps. The wells should be developed to the fullest extent possible and surveyed both vertically and horizontally by a registered surveyor to obtain accurate well location distances and water level elevations. Water levels should be measured after well development and at the time of sampling. Slug tests should be conducted to determine horizontal permeability and to provide data for evaluation of flow rates.

Chemical analysis of the water should include specific analysis for petroleum hydrocarbons. The oil and grease analysis by EPA Method 413.2 (EPA, 1979) does not differentiate between extractables of biological origin (biogenic) or the mineral oils and greases of POL origin (petrogenic); therefore, the EPA Infrared (IR) Spectrophotometric Method for total recoverable petroleum hydrocarbons (EPA Method 418.1; EPA, 1979) is recommended for assessing POL contamination. No. 2 fuel oil also contains various water-soluble components; therefore, in addition to analysis for total recoverable hydrocarbons, analyses should also be performed for the parameters shown in Table 6.1-2. The water-soluble constituents shown in Table 6.1-2 have a greater potential for migration than the bulk of the fuel oil. Percolating rainfall may mobilize these

USAFLA 02/28/85



SOURCE: ESE, 1985.

Figure 6.1-2 RECOMMENDED MONITOR WELL CONSTRUCTION DETAILS	INSTALLATION RESTORATION PROGRAM LOS ANGELES AIR FORCE STATION

Table 6.1-2. Concentrations of Constituents in the Water-Soluble Fraction of No. 2 Fuel Oil

Parameter	Concentration (mg/1)
Benzene	0.11
Toluene	0.17
o-Xylene	0.12
m-p Xylene	0.17
3-C Benzenes	0.18
Naphthalene	0.15
1-Methylnaphthalene	0.13
2-Methylnaphthalene	0.25
Dimethylnaphthalene	0.14
Total mono-aromatic hydrocarbons	0.75
Total di-aromatic hydrocarbons	0.67
Ratio of mono-/di-aromatic hydrocarbons	1.1/1
Total aromatic hydrocarbons	1.42
Total hydrocarbons	1.26

Source: API, 1979.

constituents from the bulk fuel oil retained within the soils and transport these chemicals to the water-table aquifer.

Since this area contains a large number of petroleum-related industries and oil wells, there is a potential that other subsurface releases of petroleum products have occurred. Detailed chemical characterization of the fuel oil, therefore, may be necessary to distinguish this release and its zone of contamination from other petroleum spills. These chemical identification techniques may include IR absorption spectral characterization and/or trace metal ratios.

SITE NO. 2: PESTICIDE DISPOSAL SITE

Soil sampling should be performed at the discharge point of the former pesticide wastewater drain line. Soils should be sampled by coring at several locations to a total depth of 18 to 24 inches. To determine the vertical extent of residual contamination, analyses should be performed at approximately 6-inch intervals within each core sample. All soil samples should be analyzed by gas chromatography/mass spectrometry (GC/MS) screening for pesticides. Additionally, several pesticides may have contained trace metals (i.e., arsenic, lead, copper, and mercury). The soil fractions, therefore, should also be analyzed for these metals. A background sample should also be collected at some distance from the discharge point and analyzed for the same parameters.

6.2 BASE ENVIRONMENTAL PROGRAM RECOMMENDATIONS

The operating stormwater drainage disposal site (Site No. 5) needs to be reviewed by the Base Environmental Program, and operational modifications should be made in accordance with state and federal regulations. The former neutralization basin (Site No. 3) needs to be investigated by the Base Environmental Program. Residual sludges (if any) in this basin should be sampled and analyzed for trace metals (including copper, cadmium, and nickel) and cyanide, and the sludges disposed of appropriately.

6.3 RECOMMENDED GUIDELINES FOR LAND USE

It is desirable to have land use restrictions for the identified disposal sites for the following reasons: (1) to provide the continued protection of human health, welfare, and the environment; (2) to ensure that the migration of potential contaminants is not promoted through improper land uses; (3) to facilitate the compatible development of future USAF facilities; and (4) to allow for identification of property which may be proposed for excess or outlease.

The recommended guidelines for land use restrictions at the two identified disposal sites at LAAFS are presented in Table 6.2-1. Descriptions of the land use restriction guidelines are presented in Table 6.2-2. Land use restrictions at these sites should be reevaluated upon completion of the Phase II monitoring program and changes should be made where appropriate.

Table 6.2-1. Recommended Guidelines for Future Land Use at the Two Potential Contamination Sites

Site	Recommended Guidelines for Future Land Use											
	Construction on the site	Excavation	Well construction on or near the site	Agricultural use	Silvicultural use	Water infiltration (runon, ponding, irrigation)	Recreational use	Burning or ignition source	Disposal operations	Vehicular traffic	Material storage	Housing on or near the site
Fuel Spill Site (FS-1)	R	R	R	NA	NA	R	NA	NA	NA	NR	NR	NA
Chemical Disposal Site (DS-1)	R	R	R	NA	NA	R	NA	NA	NA	NR	NR	NA

Key:
R = Restriction.
NR = No restriction.
NA = Not applicable.

Note: See Table 6.2-2 for definitions of land use restrictions.

Source: ESE, 1985.

Table 6.2-2. Descriptions of Guidelines for Land-Use Restrictions

Guideline	Description
Construction on the site	Restrict the construction of structures which make permanent (or semipermanent) and exclusive use of a portion of the site's surface.
Excavation	Restrict the disturbance of the cover or subsurface materials.
Well construction on or near the site	Restrict the placement of any wells (except for monitoring purposes) on or within a reasonably safe distance of the site. This distance will vary from site to site, based on prevailing soil conditions and ground water flow.
Agricultural use	Restrict the use of the site for agricultural purposes to prevent food-chain contamination.
Silvicultural use	Restrict the use of the site for silvicultural uses (root structures could disturb cover or subsurface materials).
Water infiltration	Restrict water runon, ponding, and/or irrigation of the site. Water infiltration could produce contaminated leachate.
Recreational use	Restrict the use of the site for recreational purposes.
Burning or ignition sources	Restrict any and all unnecessary sources of ignition, due to the possible presence of flammable compounds.
Disposal operations	Restrict the use of the site for waste disposal operations, whether above or below ground.
Vehicular traffic	Restrict the passage of unnecessary vehicular traffic on the site due to the presence of explosive material(s) and/or of an unstable surface.
Material storage	Restrict the storage of any and all liquid or solid materials on th. site.
Housing on or near the site	Restrict the use of housing structures on or within a reasonably safe distance of the site.

Source: ESE, 1985.

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b. Sanitary Sewerage System, Tab No. G-2 (Sheet 1 of 4);
c. Storm Drainage Plan, Tab No. G-3 (Sheet 1 of 4); and
d. Central Heating and Gas Systems, Tab No. G-5 (Sheet 1 of 4).

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APPENDIX A

GLOSSARY OF TERMINOLOGY, ABBREVIATIONS, AND ACRONYMS

APPENDIX A
GLOSSARY OF TERMINOLOGY, ABBREVIATIONS, AND ACRONYMS

ABG	Air Base Group
AFAA	Air Force Audit Agency
AFB	Air Force Base
AFBMD	Air Force Ballistic Missile Division
AFESC	Air Force Engineering and Service Center
AFS	Air Force Station
AFSC	Air Force Systems Command
AFSCF	Air Force Satellite Control Facility
AFTEC	Air Force Test and Evaluation Center
AMC	Air Materiel Command
Aquifer	A geologic formation, group of formations, or part of a formation capable of yielding water to a well or spring
ARDC	Air Research and Development Command
ARPA	Advanced Research Projects Agency
AVS	Audio Visual Squadron
BEE	Bioenvironmental Engineering
BSD	Ballistics Systems Division
BX	Base Exchange
CERCLA	Comprehensive Environmental Response, Compensation, and Liability Act
CESO	Communication Electronics Support Office
Contamination	Degradation of natural water quality to the extent that its usefulness is impaired; degree of permissible contamination depends on intended use of water

DCA	Defense Communications Agency
DEQPPM	Defense Environmental Quality Program Policy Memorandum
Det.	Detachment
DF	Diesel fuel
Disposal of hazardous waste	Discharge, deposit, injection, dumping, spilling, or placing of any hazardous waste into or on land or water so that such waste, or any constituent thereof, may enter the environment, be emitted into the air, or be discharged into any waters, including ground water
DOD	Department of Defense
Downgradient	In the direction of decreasing hydraulic static head; the direction in which ground water flows
DPDO	Defense Property Disposal Office
DS	Chemical disposal site
DSCS	Defense Satellite Communications System
Effluent	Liquid waste discharged in its natural state or partially or completed treated, from a manufacturing or treatment process
EP	Extraction procedure--EPA's standard laboratory procedure for leachate generation
EPA	U.S. Environmental Protection Agency
ESE	Environmental Science and Engineering, Inc.
FS	Fuel spill site
ft	feet
gal	gallon(s)
gal/yr	gallon(s) per year
GC/MS	Gas chromatography/mass spectrometry
gpm	gallon(s) per minute

Ground water	Water beneath the land surface in the saturated zone that is under atmospheric or artesian pressure
HARM	Hazard Assessment Rating Methodology
Hazardous waste	As defined in RCRA, a solid waste or combination of solid wastes which because of its quantity, concentration, or physical, chemical, or infectious characteristics may cause or significantly contribute to an increase in mortality or an increase in serious, irreversible, or incapacitating reversible illness; or pose a substantial present or potential hazard to human health or the environment when improperly treated, stored, transported, disposed of, or otherwise managed
HQ	Headquarters
ICBM	Intercontinental ballistic missile
Infiltration	Movement of water through the soil surface into the ground
IOC	Initial operating capability
IR	Infrared
IRBM	Intermediate-range ballistic missile
Iridite	Commercial product containing chromic acid and fluoride
IRP	Installation Restoration Program
LA	Los Angeles
LAAFS	Los Angeles Air Force Station
lb	pound(s)
lb/yr	pound(s) per year
LPG	Liquid petroleum gas
MCL	Maximum contaminant level
MES	Management Engineering Squadron

mg/l	milligram(s) per liter
MOGAS	Motor gasoline
MSL	Mean sea level
NA	Not applicable
NASA	National Aeronautics and Space Administration
NATO	North Atlantic Treaty Organization
NCOIC	Noncommissioned Officer-in-Charge
NIPDWR	National Interim Primary Drinking Water Regulation batteries, plating, and other industrial applications; highly toxic to humans and aquatic life
NPDES	National Pollutant Discharge Elimination System
NSDWR	National Secondary Drinking Water Regulation
NSSA	Navy Space Systems Activity
OL	Operating Location
OSI	Office of Special Investigations
PCB	Polychlorinated biphenyl--liquid used as a dielectric in electrical equipment; suspected human carcinogen; bioaccumulates in the food chain and causes toxicity to higher trophic levels
Permeability	The capacity of a porous rock, soil, or sediment of transmitting a fluid without damage to the structure of the medium
POL	Petroleum, oils, and lubricants
PVC	Polyvinyl chloride plastic
RCRA	Resource Conservation and Recovery Act
R&D	Research and Development
SAC	Strategic Air Command
SAMSO	Space and Missile Systems Organization
SAMTO	Space and Missile Test Organization

SD	Space Division
SD	Sanitary and stormwater drainage disposal sites
Spill	An unplanned release or discharge of a hazardous waste onto or into air, land, or water
SSD	Space Systems Division
STL	Space Technology Laboratories
TDS	Total dissolved solids
TSCA	Toxic Substances Control Act
UG	Underground
umhos/cm	micromhos per centimeter
Upgradient	In the direction of increasing hydraulic static head; the direction opposite to the prevailing flow of ground water
USAF	U.S. Air Force
Water table	Surface of a body of unconfined ground water at which the pressure is equal to that of the atmosphere
WDD	Western Development Division
WS	Weapon system
yd	yard(s)
yd^3	cubic yard(s)

APPENDIX B

TEAM MEMBER BIOGRAPHICAL DATA

CHARLES D. HENDRY, JR., Ph.D.
Staff Chemist

ESE PROFESSIONAL RESUME

SPECIALIZATION

Water Quality Chemistry, Atmospheric Chemistry, Physical-Chemical Transport of Toxic/Hazardous Substances, Environmental Fate of Toxic Substances

RECENT EXPERIENCE

Toxic/Hazardous Materials, Handling and Disposal, USATHAMA and NEESA, Project Manager--Assessment of present and past handling and disposal practices for toxic/hazardous materials on 32 U.S. Army and Navy installations conducted for USATHAMA and NEESA. These sites include seven installations in the southeastern United States. Includes evaluation of the potential for off-post migration of toxic materials, recommendations for sampling and analysis, and compliance with existing federal and state regulations.

Toxic Substances--Fate in the Environment, U.S. Environmental Protection Agency, Subproject Manager--Assessment of the release transport and fate of toxic organic and inorganic substances in the environment. This assessment is based upon physical and chemical properties (e.g., volatility, solubility, photolysis, hydrolysis, sorption, and biodegradation) of the compounds and evaluation of predicted environmental concentrations using computer models.

Toxic/Hazardous Materials Sampling and Analysis-Quality Assurance/Control--Analytical chemistry QA/QC for project involving sampling and analysis of soils, waters, and biota at a U.S. Army ammunition manufacturing plant, Alabama Army Ammunitions Plant, Alabama.

Florida Power Coordinating Group, Atmospheric Deposition Study, Technical Consultant--Three-year study measuring deposition of chemical substances by atmospheric precipitation. Includes monitoring, source attribution studies, and ecological effects evaluation. Emphasis placed upon water quality impacts.

EDUCATION

Ph.D.	1983	Environmental Engineering	University of Florida
M.S.	1977	Environmental Engineering	University of Florida
B.S.	1974	Chemistry	University of Florida

ASSOCIATIONS

American Chemical Society
Water Pollution Control Federation
Air Pollution Control Association

RECENT REPORTS

Approximately 35 hazardous waste site investigations of U.S. military installations.

PUBLICATIONS

Approximately 15 publications related to transport and transformation of pollutants in the atmosphere and the aquatic environment.

ESE PROFESSIONAL RESUME

ALLEN P. HUBBARD, B.S.E.
Department Manager, Remedial Engineering

SPECIALIZATION

Hazardous Waste Management, Remedial Actions, Industrial Waste Operations Design and Permitting

RECENT EXPERIENCE

Design and Implementation of Remedial Actions for Petroleum Product Spill in a Stormwater Detention Basin, Project Manager--Manager for site investigations, alternatives evaluation, engineering design, and confirmation of decontamination. Project involved a site at which an undetermined large volume of petroleum products had been spilled into a stormwater collection system over a period of 10 to 15 years. Site was decontaminated and restored to FDER specifications.

Superfund Site Remedial Action Feasibility Study, Sapp Battery Site, Florida, Project Engineer--Under contract to Florida Department of Environmental Regulation (DER), ESE is evaluating potential remedial actions for this former industrial facility contaminated with lead and sulfuric acid from past battery reclamation operations. Project engineers are responsible for development of initial and long-term remedial measures for eliminating actual and potential contaminant migration with cost and liability as primary factors.

Project Manager/Engineer Hazardous Waste Delisting Projects, Project Manager--Four separate projects for three plants in the steel finishing industry. Projects included negotiation with state and federal agencies (in different states), sampling and analysis, and formal petition documents to exclude listed hazardous wastes from RCRA regulations according to 40 CFR Part 260.22.

Hazardous Waste Inventory and Delisting, Carolina Galvanizing Corporation (CGC), Aberdeen, North Carolina, Project Manager--Developed sampling and analysis plan after evaluating plant processes and regulatory requirements specific to CGC. Sludge analyses demonstrated that the generated sludge met delisting criteria. Delisting petition prepared for EPA Region IV and the North Carolina Department of Human Resources (DHR). Also performed a hydrogeologic survey to demonstrate that sludge could be deposited in an onsite landfill, which was later designed and permitted. Responsibilities included supervising sampling, negotiation with regulatory agencies and clients, preparing and overseeing fixation studies, and evaluating all reports.

Project Manager/Engineer RCRA Closure Plans for Hazardous Waste Treatment and Storage Facilities, Project Manager--Developed plans for five separate clients for closure of hazardous waste treatment, storage, disposal facilities (TSDFs). Types of operations included hazardous waste incinerator, burning ground, and storage tank farm, chemical/physical treatment system, land treatment facility, surface impoundments. Final plans complied with 40 CFR Part 265.

Industrial Wastewater Permit for Coal-Slag Reclamation Facility, Mineral Aggregates, Inc. (Lonestar Minerals), Tampa, Florida, Project Engineer—Prepared engineering report for permit application involving reuse of bottom slag from a coal-fired power plant. Client recycles the slag as sandblasting grit, roofing material, and other products. Runoff from slag piles enters Tampa Bay, necessitating a mixing zone as part of the permit.

Hazardous Waste Remedial Action/Decontamination Study, Alabama Army Ammunition Plant, Project Engineer—Project to develop and implement corrective measures for decontamination of buildings, process equipment, sewers and soil to control surface water and ground water contamination at U.S. Army ammunition plant. Developed decontamination alternatives with consideration of risk, cost and technical feasibility.

Industrial Wastewater Treatment/Disposal System Design and Permitting Projects, Project Manager, Project Engineer—Seven permitting projects for industrial clients in various SIC codes (two metal finishing, two food and beverage, one aircraft maintenance, and two cement products). These industrial permitting projects involved conceptual and final design, waste characterization, report preparation, extensive negotiation with regulatory agencies, and interaction with legal counsel for some clients.

Expert Witness Testimony for Industrial Clients, Ardmore Farms and Martin Electronics, Inc., Florida—Testimony helped the clients with a lawsuit and regulatory action to avoid costly penalties.

Preparation of RCRA Part B Permit Applications, Project Engineer—Responsible for various engineering aspects of Part B applications for five industrial clients. Facilities included storage tanks, chemical/physical treatment operations, and land disposal. Permitting involved both federal and state criteria.

Hazardous Waste Landfill Siting Study, Allied Chemical Company, Project Engineer—Evaluation of six existing commercial hazardous waste disposal sites, including development of corrective construction requirements and RCRA comipliance measures required. This study included location of potential sites for a hazardous waste landfill using RCRA siting criteria.

Industrial/Hazardous Waste Characterization and Evaluation, Project Engineer—Evaluation of existing and proposed industrial and hazardous waste treatment storage and disposal facilities at three industrial free zones in Egypt. Project included a characterization of wastes using RCRA regulations.

EDUCATION

B.S.E. 1979 Environmental Engineering University of Florida

REGISTRATION

P.E. Florida 1984

ASSOCIATION

American Society of Civil Engineers

JEFFREY J. KOSIK, B.S.E.
Associate Engineer

ESE PROFESSIONAL RESUME

SPECIALIZATION

Hazardous Waste Management, Water and Wastewater Treatment, Water Supply and Field of Investigations

RECENT EXPERIENCE

Initial Assessment Studies for the United States Air Force, Team Engineer--Comprehensive studies at 2 Air Force bases to determine both past and present history with regard to the use and disposal of toxic and hazardous materials. Conducted in accordance with the Department of Defense Installation Restoration Program policies.

Reassessment for Hazardous Wastes at Army Installation, Team Engineer--Comprehensive study at an Army installation to determine both past and present history with respect to the use of hazardous substances, quantities used, disposal methods and disposal sites. Also includes a current assessment of safety practices and compliance with regulations.

Hazardous Waste Survey and Assessment and Review of Potential Liability for a Major U.S. Industrial Corporation, Project Engineer--Comprehensive survey of over 50 corporate facilities to determine past and present activities with respect to the use of hazardous substances, quantities used, disposal methods, disposal sites and potential legal liability of those activities. Study also includes an assessment of compliance with regulations.

Industrial Wastewater Treatment/Disposal Systems Design and Permitting, Project Engineer--Several projects for the conceptual and final design of a treatment/disposal system, design of treatment instrumentation systems, and permitting.

Effluent Guidelines Development for the Pharmaceuticals Manufacturing Point Source Category, Project Engineer-- Comprehensive study for wastewater characterization, treatment system performance evaluation, and estimation of installation and operating costs for treatment systems to remove toxic and conventional pollutants.

EDUCATION

B.S.E.	1982	Environmental Engineering	University of Florida
1984	Hazardous Materials/Site Investigations Training Course		

AFFILIATIONS

Society of Environmental Engineers
American Water Works Association
Water Pollution Control Federation
Boy Scouts of America
American Red Cross

DONALD F. McNEILL, M.S.
Associate Scientist

ESE PROFESSIONAL RESUME

SPECIALIZATION

Hydrogeology, Ground Water Monitoring and Evaluation Clastic Sedimentology, Carbonate Sedimentology, Peat and Org nic Sediment Analysis, Geomorphology, Stratigraphy, Field Mapping, nd Sampling Techniques

RECENT EXPERIENCE

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of Ft. Riley, Kansas. Geohydrologic assessment of present and past waste disposal methods, responsible for evaluation of the potential for migration of contaminants in the subsurface.

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of Military District of Washington. Geohydrologic assessment of present and past waste disposal methods, responsible for evaluation of the potential for migration of contaminants in the subsurface.

U.S. Army Toxic and Hazardous Materials Agency, Project Geologist--Installation assessment of West Virginia Ordnance Works. Geologic and ground water investigation of past waste disposal methods. Responsible for evaluation of ground water contamination and off-post contaminants migration.

Florida Department of Environmental Regulation, Site Contamination Assessment, Project Hydrogeologist--Investigated organic and inorganic contamination at City Chemical Company, Orlando, Florida. Assessment of shallow aquifer with respect to contaminant migration.

EDB Contamination Investigation, Project Hydrogeologist--Investigated EDB contamination of drinking water wells at Sanford, Florida, including drilling and field sampling, installation of piezometers, measuring water levels and sampling wells, evaluating alternatives, and preparing report.

Adcom Wire Company, Project Hydrogeologist--Development of a ground water monitoring plan for a wire galvanizing plant including site analysis, geohydrology, and proposed ground water monitoring network.

Orange County, Project Hydrogeologist--Development of a ground water monitoring plan for a sanitary landfill near Orange, Florida. Project consisted of monitor well installation, measuring water levels, geohydrologic evaluation and report preparation.

U.S. Air Force Installation Restoration Program, Project Geologist--Installation assessment of Columbus, Andersen, and Vandenburg Air Force Bases. Responsible for geohydrologic evaluation of sanitary and solid waste disposal areas, and the potential for off-post migration.

Minerals Management Service, Project Geologist--Responsible for sediment core and sediment trap analysis for evaluation of sediment transport in selected areas of the Gulf of Mexico.

University of Florida, Research Associate--Texaco U.S.A.- funded research grant involving the development of a method of increasing BTU values in autochthonous mineral-rich peats and organic sediments.

Department of Energy and Governor's Energy Office, State of Florida, Research Assistant--Florida fuel grade peat assessment program conducted through the University of Florida; involved sampling, mapping, and analysis of Florida fuel peat resources.

EDUCATION

M.S.	1983	Geology	University of Florida
B.S.	1981	Geology	State University of New York

AFFILIATIONS

American Association of Petroleum Geologists--Energy Minerals Division
Geological Society of America
Southeastern Geological Society
Society of Economic Paleontologists and Mineralogists

APPENDIX C

LIST OF INTERVIEWEES AND OUTSIDE AGENCY CONTACTS

APPENDIX C

LIST OF INTERVIEWEES

Interviewee		Year of Service at LAAFS
1.	Senior Safety Engineer, Aerospace Corp.	23
2.	Machinist-Repairman, Aerospace Corp.	28
3.	Environmental Engineer, Pacifica Services, Inc.	3
4.	Entomologist, Pacifica Services, Inc.	2
5.	Architect, Pacifica Services, Inc.	9
6.	Lead Draftsman, Pacifica Services, Inc.	9
7.	Foreman, Water Treatment, Pacifica Services, Inc.	7
8.	Foreman, Mechanical Shop, Pacifica Services, Inc.	0.5
9.	Foreman, Structural Shop, Pacifica Services, Inc.	2
10.	Paint Shop Operator, Pacifica Services, Inc.	10
11.	Foreman, Structural Shop, Pacifica Services, Inc.	2
12.	Foreman, Operations and Maintenance, Pacifica Services, Inc.	3
13.	Manager, Base Transportation Maintenance, DEL-JEN, Inc.	18
14.	Real Property Manager	21
15.	Former Grounds and Maintenance Foreman	16
16.	Manager, Det. 13 Photo Shop	17
17.	Noncommissioned Officer-In-Charge (NCOIC), 2080th Communications Squadron	3
18.	NCOIC, Reprographics	5
19.	BX Service Station Manager	10
20.	Environmental Health Engineer, USAF Clinic	1
21.	Contracts-Project Office Staff Member	2
22.	Bioenvironmental Engineer, BEE	1

APPENDIX C

OUTSIDE AGENCY CONTACTS

1. George S. Farag
   Ground Water Recharge Section
   Water Conservation Division
   Los Angeles County Flood Control District
   2250 Alcazar Street
   Los Angeles, CA 90033
   213/226-4382

2. California Division of Mines and Geology, Sacramento, CA.

3. Albert F. Simpson Historical Research Center, Maxwell AFB, AL.

4. U.S. Geological Survey, Alexandria, VA, and Denver, CO.

5. California Dept. of Fish and Game, Sacramento, CA.

6. California Dept. of Water Resources, Sacramento, CA.

7. Central and West Basin Water Replenishment District, Downey, CA.

8. National Archives, Modern Military Branch, Washington, DC.

9. DOD Explosives Safety Board, Alexandria, VA.

10. USAEHA, Aberdeen Proving Ground, MD.

APPENDIX D

ORGANIZATIONS, MISSIONS, AND TENANT ACTIVITIES

APPENDIX D

ORGANIZATIONS, MISSIONS, AND TENANT ACTIVITIES

PRIMARY ORGANIZATIONS

SPACE DIVISION

The SD is responsible for the research, development, procurement, production, test, and delivery of most DOD space systems.

6592ND AIR BASE GROUP

The 6592nd ABG provides the facilities and administrative, logistical, and transportation support for all organizations and personnel assigned or attached to LAAFS. Also, this group develops and administers ground safety programs and base support contracts for LAAFS. The 6592nd ABG also has special court-martial and Article 15, Uniform Code of Military Justice jurisdiction over officers and airmen assigned to the group and over airmen assigned or attached to LAAFS.

USAF CLINIC

The clinic monitors medical support provided SD subordinate units and other units under host-tenant support agreements. The clinic provides outpatient medical, dental, and optometric services to military personnel stationed at LAAFS and other military personnel in the area.

TENANTS

AEROSPACE CORPORATION

The Aerospace Corp. is a nonprofit corporation that provides research and development, systems engineering, and technical direction for USAF space programs.

DET. 27, MANAGEMENT ENGINEERING SQUADRON

Det. 27, MES provides interface between HQ AFSC (Directorate of Manpower and Organization) and the SD Commander on manpower, organization, and management engineering activities.

AIR FORCE AUDIT AGENCY

The AFAA provides all levels of Air Force management with an independent, objective, and constructive evaluation of the effectiveness and efficiency with which managerial responsibilities are conducted.

2080TH COMMUNICATIONS SQUADRON

This squadron is comprised of the Base Communications Office and the SD Communication Electronics Support Office (CESO). The Base Communications Office is responsible for planning, programming, and providing secure base teletype communications and telephones for organizations assigned or attached to LAAFS. CESO provides communications staff support to SD, including planning, programming, budgeting, communication security, and radio frequency management.

DEFENSE COMMUNICATIONS AGENCY

The DCA monitors and assists SD in compliance with DoD satellite communication policies and directives to develop, launch, and control the space portion of the Defense Satellite Communications System (DSCS). The DCA serves as liaison between SD and aerospace industry to facilitate timely exchange of technical, logistics, and administrative information pertaining to the DSCS. Also, the DCA identifies, analyzes, and reports all potential and existing problem areas within DSCS, including space and ground elements.

DET. 13, 1369TH AUDIO VISUAL SQUADRON

Det. 13, 1369th AVS provides support to SD in production of motion picture films for management communications, operates a color processing and printing laboratory for still photography, and provides still photography for all SD functions and tenant functions associated with LAAFS.

NAVY SPACE SYSTEMS ACTIVITY

The NSSA performs management and engineering functions related to joint service space system developments and ensures coordination and

cooperation between the Navy and the Air Force on conceptual, technical, and engineering of space programs of mutual interest.

OFFICE OF SPECIAL INVESTIGATION, DET. 1811

OSI Det. 1811 conducts investigations in portions of Los Angeles, Ventura, and Orange Counties in providing criminal, counterintelligence, and special investigative services to commanders of all Air Force and other DOD activities.

SAC SYSTEMS OFFICE

The SAC Systems Office provides qualified operational command representation to the system program offices, SD Staff, contractors, and other resident development agencies to ensure that SAC interests receive operational command attention during the conceptual, advanced development, engineering development, and full-scale development phases.

HQ AIR FORCE TEST AND EVALUATION CENTER OPERATING LOCATION AC

AFTEC conducts operational tests and evaluations with programs at SD which require operational testing IAW AFR 80-14. The operating location is under the control of the Chief, Space and Reconnaissance Division, Directorate of Test and Evaluation, HQ AFTEC, Kirtland AFB, NM. For administrative purposes, the personnel are assigned to HQ AFTEC, OL-AC, Los Angeles AFS, CA.

DEFENSE CONTRACT AUDIT AGENCY

The Defense Contract Audit Agency provides the procurement and/or contract administration staff with expert technical advice of an audit nature relative to contract negotiation and administration. This agency provides advice as to the need for field audit, based on the content of the requests, estimates of the time required for the audit, and the circumstances. The liaison auditor may review audited data previously reported by Defense Contract Audit Offices and obtain additional current data and, where necessary, furnish a memorandum report to the procurement offices.

AIR TRAINING COMMAND RESIDENT OFFICE

The Air Training Command Resident Office represents Hqs ATC and participates in SD programs and projects to ensure that ATC requirements are established, developed, and satisfied.

LOS ANGELES COURIER STATION

The LA Courier Station handles and transfers all Armed Forces courier materials between San Francisco, Calif.; Washington, D.C.; and San Diego, Calif.

DET 50, 2 WEATHER SQUADRON

The Staff Meteorology Office provides staff natural Aerospace environmental support to all LAAFS organizations to ensure that the impact of the natural Aerospace environmental parameters is considered thoroughly in the design, development, and performance of space systems.

NORTH ATLANTIC TREATY ORGANIZATION PROJECT TEAM

The NATO Project Team represents a NATO Navstar GPS Program, referred to as the NATO GPS Project. Personnel are integrated within the DOD Navstar GPS Joint Program Office (JPO). Functional address symbol is SD/YEI.

DEFENSE MAPPING AGENCY AEROSPACE CENTER

The Defense Mapping Agency operates as staff level office attached to Navstar Global Positioning System, SD/YE.

APPENDIX E

MASTER LIST OF SHOPS AND LABS

APPENDIX E

MASTER LIST OF SHOPS AND LABS

Shop Name	Location	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Method
<u>6592D AIR BASE GROUP</u>				
CIVIL ENGINEERING				
Paint Shop	223	No	Yes	Contract Disposal
Sheet Metal and Welding Shop	228	No	Yes	Contract Disposal
Carpentry Shop	229	No	No	
Pavement and Grounds	228, 229	Yes	Yes	Contract Disposal
Electrical and Mechanical	228, 229	Yes	Yes	Contract Disposal
Heating and Air Conditioning	228, 229	No	Yes	Contract Disposal
Water Treatment	Basewide	No	No	
Facilities Engineering	229	No	No	
Entomology	229	Yes	Yes	Contract Disposal
RECREATION SERVICES				
Auto Hobby Shop	215	No	Yes	Contract Disposal
Wood Hobby Shop	215	No	No	
BASE TRANSPORTATION				
Vehicle Maintenance Shop	219	No	Yes	Contract Disposal
ADMINISTRATION				
Reprographics	244	No	No	
CLINIC				
Dental Lab/Clinic	200	Yes	Yes	Contract Disposal
Medical X-Ray Lab	200	No	Yes	Silver Recovery

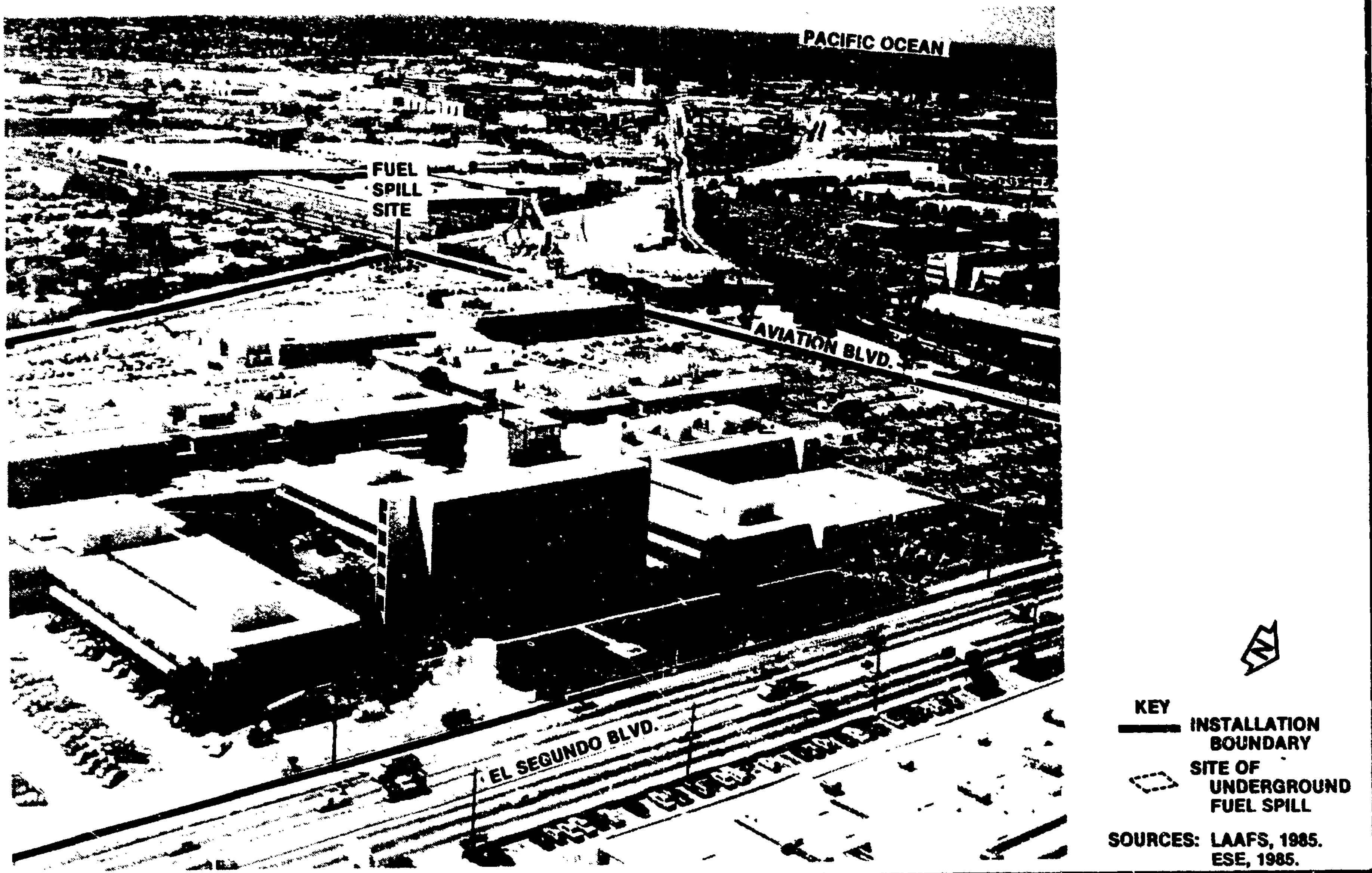
APPENDIX E

MASTER LIST OF SHOPS AND LABS
(Continued, Page 2 of 2)

Shop Name	Location	Handles Hazardous Materials	Generates Hazardous Wastes	Typical Treatment, Storage, and Disposal Method
TENANTS				
DET. 13, 1369th AUDICVISUAL SQUADRON				
Photo Lab	130	No	Yes	Silver Recovery
2080th COMMUNICATIONS SQUADRON				
Maintenance Shop	130	Yes	Yes	Contract Disposal
BASE EXCHANGE				
Service Station	235	Yes	Yes	Contract Disposal
CONTRACTORS				
AEROSPACE CORP.				
Research Laboratories	130	Yes	Yes	Contract Disposal

APPENDIX F

PHOTOGRAPHS OF FUEL SPILL SITE AND PESTICIDE DISPOSAL SITE



LOCATION OF UNDERGROUND FUEL SPILL ON AREA A

INSTALLATION RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

KEY

- - - - UNDERGROUND DRAIN PIPE

▱ DRAIN

LOCATION OF PESTICIDE DISPOSAL SITE

INSTALLATION RESTORATION PROGRAM
LOS ANGELES AIR FORCE STATION

APPENDIX G

USAF IRP HAZARD ASSESSMENT RATING METHODOLOGY

APPENDIX G

USAF INSTALLATION RESTORATION PROGRAM
HAZARD ASSESSMENT RATING METHODOLOGY

BACKGROUND

The Department of Defense (DOD) has established a comprehensive program to identify, evaluate, and control problems associated with past disposal practices at DOD facilities. One of the actions required under this program is to:

> "develop and maintain a priority listing of contaminated installations and facilities for remedial action based on potential hazard to public health, welfare, and environmental impacts." (Reference: DEQPPM 81-5, 11 December 1981).

Accordingly, the United States Air Force (USAF) has sought to establish a system to set priorities for taking further actions at sites based upon information gathered during the Records Search phase of its Installation Restoration Program (IRP).

The first site rating model was developed in June 1981 at a meeting with representatives from USAF Occupational Environmental Health Laboratory (OEHL), Air Force Engineering Services Center (AFESC), Engineering-Science (ES) and CH_2M Hill. The basis for this model was a system developed for EPA by JRB Associates of McLean, Virginia. The JRB model was modified to meet Air Force needs.

After using this model for 6 months at over 20 Air Force installations, certain inadequacies became apparent. Therefore, on January 26 and 27, 1982, representatives of USAF OEHL, AFESC, various major commands, Engineering Science, and CH_2M Hill met to address the inadequacies. The result of the meeting was a new site rating model designed to present a better picture of the hazards posed by sites at Air Force installations. The new rating model described in this presentation is referred to as the Hazard Assessment Rating Methodology.

PURPOSE

The purpose of the site rating model is to provide a relative ranking of sites of suspected contamination from hazardous substances. This model will assist the Air Force in setting priorities for follow-on site investigations and confirmation work under Phase II of IRP.

This rating system is used only after it has been determined that (1) potential for contamination exists (hazardous wastes present in sufficient quantity), and (2) potential for migration exists. A site can be deleted from consideration for rating on either basis.

DESCRIPTION OF MODEL

Like the other hazardous waste site ranking models, the U.S. Air Force's site rating model uses a scoring system to rank sites for priority attention. However, in developing this model, the designers incorporated some special features to meet specific DOD program needs.

The model uses data readily obtained during the Record Search portion (Phase I) of the IRP. Scoring judgments and computations are easily made. In assessing the hazards at a given site, the model develops a score based on the most likely routes of contamination and the worst hazards at the site. Sites are given low scores only if there are clearly no hazards at the site. This approach meshes well with the policy for evaluating and setting restrictions on excess DOD properties.

As with the previous model, this model considers four aspects of the hazard posed by a specific site: the possible receptors of the contamination, the waste and its characteristics, potential pathways for waste contaminant migration, and any efforts to contain the contaminants. Each of these categories contains a number of rating factors that are used in the overall hazard rating.

The receptors category rating is calculated by scoring each factor, multiplying by a factor weighting constant and adding the weighted scores to obtain a total category score.

The pathways category rating is based on evidence of contaminant migration or an evaluation of the highest potential (worst case) for contaminant migration along one of three pathways. If evidence of contaminant migration exists, the category is given a subscore of 80 to 100 points. For indirect evidence, 80 points are assigned and for direct evidence 100 points are assigned. If no evidence is found, the highest score among three possible routes is used. These routes are surface water migration, flooding, and ground-water migration. Evaluation of each route involves factors associated with the particular migration route. The three pathways are evaluated and the highest score among all four of the potential scores is used.

The waste characteristics category is scored in three steps. First, a point rating is assigned based on an assessment of the waste quantity and the hazard (worst case) associated with the site. The level of confidence in the information is also factored into the assessment. Next, the score is multiplied by a waste persistence factor, which acts to reduce the score if the waste is not very persistent. Finally, the score is further modified by the physical state of the waste. Liquid wastes receive the maximum score, while scores for sludges and solids are reduced.

The scores for each of the three categories are then added together and normalized to a maximum possible score of 100. Then the waste management practice category is scored. Sites at which there is no containment are not reduced in score. Scores for sites with limited containment can be reduced by 5 percent. If a site is contained and well managed, its score can be reduced by 90 percent. The final site score is calculated by applying the waste management practices category factor to the sum of the scores for the other three categories.

FIGURE 1

HAZARD ASSESSMENT RATING METHODOLOGY FLOW CHART

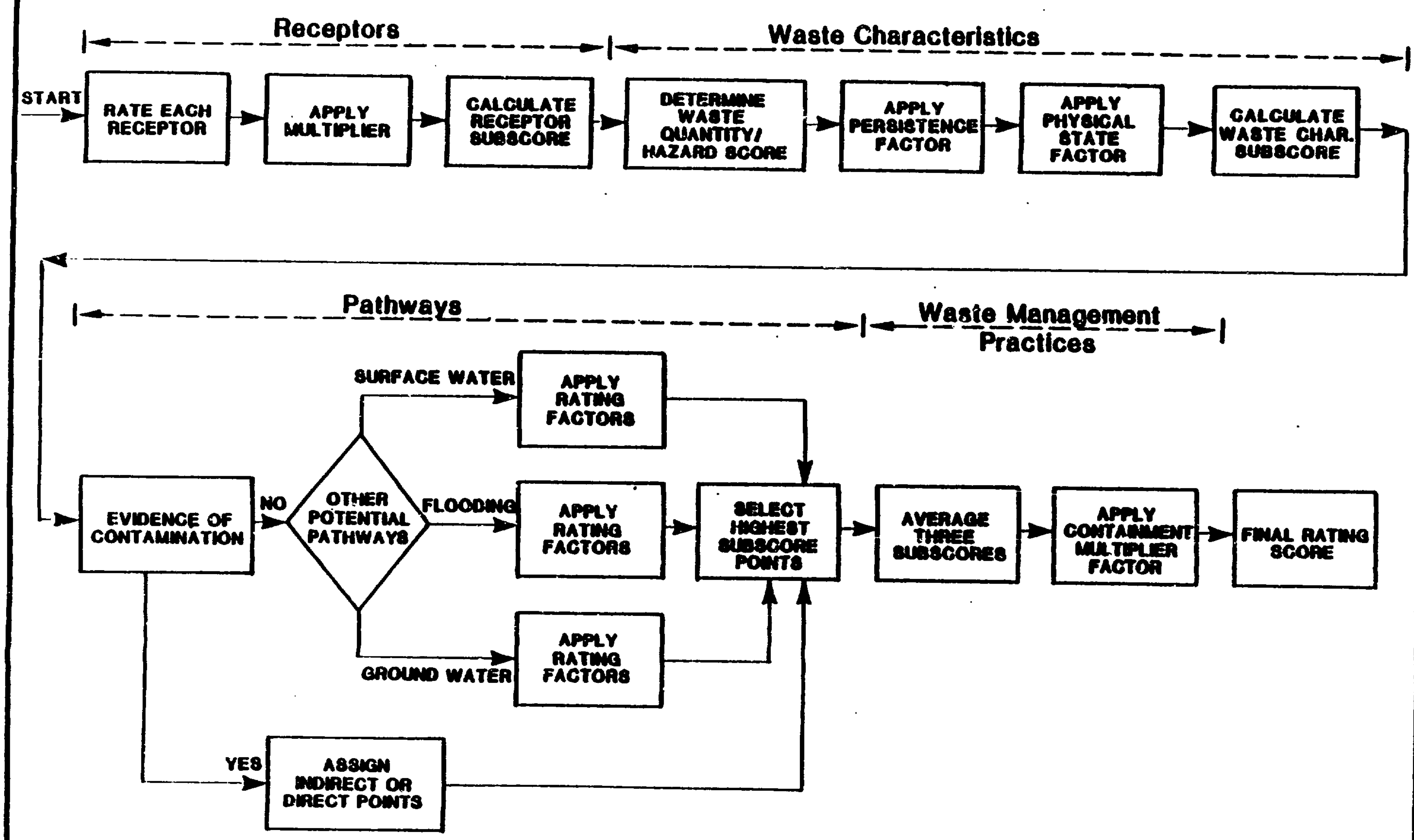


FIGURE 2

HAZARD ASSESSMENT RATING METHODOLOGY FORM

NAME OF SITE ______

LOCATION ______

DATE OF OPERATION OR OCCURRENCE ______

OWNER/OPERATOR ______

COMMENTS/DESCRIPTION ______

SITE RATED BY ______

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site		4		
B. Distance to nearest well		10		
C. Land use/zoning within 1 mile radius		3		
D. Distance to reservation boundary		6		
E. Critical environments within 1 mile radius of site		10		
F. Water quality of nearest surface water body		6		
G. Ground water use of uppermost aquifer		9		
H. Population served by surface water supply within 3 miles downstream of site		6		
I. Population served by ground-water supply within 3 miles of site		6		
		Subtotals	______	______

Receptors subscore (100 X factor score subtotal/maximum score subtotal) ______

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (S = small, M = medium, L = large) ______
2. Confidence level (C = confirmed, S = suspected) ______
3. Hazard rating (H = high, M = medium, L = low) ______

Factor Subscore A (from 20 to 100 based on factor score matrix) ______

B. Apply persistence factor
Factor Subscore A X Persistence Factor = Subscore B

______ X ______ = ______

C. Apply physical state multiplier

Subscore B X Physical State Multiplier = Waste Characteristics Subscore

______ X ______ = ______

FIGURE 2 (Continued)

III. PATHWAYS

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists then proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for 3 potential pathways: surface water migration, flooding, and ground-water migration. Select the highest rating, and proceed to C.

1. Surface water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Distance to nearest surface water		8		
Net precipitation		6		
Surface erosion		8		
Surface permeability		6		
Rainfall intensity		8		
Subtotals			______	______

Subscore (100 X factor score subtotal/maximum score subtotal) ______

2. Flooding

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Flooding		1		

Subscore (100 x factor score/3) ______

3. Ground-water migration

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
Depth to ground water		8		
Net precipitation		6		
Soil permeability		8		
Subsurface flows		8		
Direct access to ground water		8		
Subtotals			______	______

Subscore (100 x factor score subtotal/maximum score subtotal) ______

C. Highest pathway subscore.

Enter the highest subscore value from A, B-1, B-2 or B-3 above.

Pathways Subscore ______

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors ______
Waste Characteristics ______
Pathways ______

Total ______ divided by 3 = ______
Gross Total Score

B. Apply factor for waste containment from waste management practices

Gross Total Score X Waste Management Practices Factor = Final Score

______ X ______ = ______

TABLE 1

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

I. RECEPTORS CATEGORY

Rating Factors	Rating Scale Levels: 0	1	2	3	Multiplier
A. Population within 1,000 feet (includes on-base facilities)	0	1 - 25	26 - 100	Greater than 100	4
B. Distance to nearest water well	Greater than 3 miles	1 to 3 miles	3,001 feet to 1 mile	0 to 3,000 feet	10
C. Land Use/Zoning (within 1 mile radius)	Completely remote (zoning not applicable)	Agricultural	Commercial or industrial	Residential	3
D. Distance to installation boundary	Greater than 2 miles	1 to 2 miles	1,001 feet to 1 mile	0 to 1,000 feet	6
E. Critical environments (within 1 mile radius)	Not a critical environment	Natural areas	Pristine natural areas; minor wetlands; preserved areas; presence of economically important natural resources susceptible to contamination.	Major habitat of an endangered or threatened species; presence of recharge area; major wetlands.	10
F. Water quality/use designation of nearest surface water body	Agricultural or industrial use.	Recreation, propagation and management of fish and wildlife.	Shellfish propagation and harvesting.	Potable water supplies	6
G. Ground-Water use of uppermost aquifer	Not used, other sources readily available.	Commercial, industrial, or irrigation, very limited other water sources.	Drinking water, municipal water available.	Drinking water, no municipal water available; commercial, industrial, or irrigation, no other water source available.	9
H. Population served by surface water supplies within 3 miles downstream of site	0	1 - 50	51 - 1,000	Greater than 1,000	6
I. Population served by aquifer supplies within 3 miles of site	0	1 - 50	51 - 1,000	Greater than 1, 000	6

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS

A-1 Hazardous Waste Quantity

S = Small quantity (<5 tons or 20 drums of liquid)
M = Moderate quantity (5 to 20 tons or 21 to 85 drums of liquid)
L = Large quantity (>20 tons or 85 drums of liquid)

A-2 Confidence Level of Information

C = Confirmed confidence level (minimum criteria below)

- o Verbal reports from interviewer (at least 2) or written information from the records.
- o Knowledge of types and quantities of wastes generated by shops and other areas on base.
- o Based on the above, a determination of the types and quantities of waste disposed of at the site.

S = Suspected confidence level

- o No verbal reports or conflicting verbal reports and no written information from the records.
- o Logic based on a knowledge of the types and quantities of hazardous wastes generated at the base, and a history of past waste disposal practices indicate that these wastes were disposed of at a site.

A-3 Hazard Rating

Hazard Category	Rating Scale Levels 0	1	2	3
Toxicity	Sax's Level 0	Sax's Level 1	Sax's Level 2	Sax's Level 3
Ignitability	Flash point greater than 200°F	Flash point at 140°F to 200°F	Flash point at 80°F to 140°F	Flash point less than 80°F
Radioactivity	At or below background levels	1 to 3 times background levels	3 to 5 times background levels	Over 5 times background levels

Use the highest individual rating based on toxicity, ignitability and radioactivity and determine the hazard rating.

Hazard Rating	Points
High (H)	3
Medium (M)	2
Low (L)	1

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

II. WASTE CHARACTERISTICS (Continued)

Waste Characteristics Matrix

Point Rating	Hazardous Waste Quantity	Confidence Level of Information	Hazard Rating
100	L	C	H
80	L	C	M
	M	C	H
70	L	S	H
60	S	C	H
	M	C	M
50	L	S	H
	L	C	L
	M	S	M
	S	C	H
40	S	S	H
	M	S	M
	M	C	L
	L	S	L
30	S	C	L
	M	S	L
	S	S	M
20	S	S	L

Notes:
For a site with more than one hazardous waste, the waste quantities may be added using the following rules:
Confidence Level
- o Confirmed confidence levels (C) can be added
- o Suspected confidence levels (S) can be added
- o Confirmed confidence levels cannot be added with suspected confidence levels

Waste Hazard Rating
- o Wastes with the same hazard rating can be added
- o Wastes with different hazard ratings can only be added in a downgrade mode, e.g., MCM + SCH = LCM if the total quantity is greater than 20 tons.

Example: Several wastes may be present at a site, each having an MCM designation (60 points). By adding the quantities of each waste, the designation may change to LCM (80 points). In this case, the correct point rating for the waste is 80.

B. *Persistence Multiplier for Point Rating*

Persistence Criteria	Multiply Point Rating From Part A by the Following
Metals, polycyclic compounds, and halogenated hydrocarbons	1.0
Substituted and other ring compounds	0.9
Straight chain hydrocarbons	0.8
Easily biodegradable compounds	0.4

C. Physical State Multiplier

Physical State	Multiply Point Total From Parts A and B by the Following
Liquid	1.0
Sludge	0.75
Solid	0.50

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES,

III. PATHWAYS CATEGORY

A. Evidence of Contamination

Direct evidence is obtained from laboratory analyses of hazardous contaminants present above natural background levels in surface water, ground water, or air. Evidence should confirm that the source of contamination is the site being evaluated.

Indirect evidence might be from visual observation (i.e., leachate), vegetation stress, sludge deposits, presence of taste and odors in drinking water, or reported discharges that cannot be directly confirmed as resulting from the site, but the site is greatly suspected of being a source of contamination.

B-1 POTENTIAL FOR SURFACE WATER CONTAMINATION

Rating Factor	Rating Scale Levels 0	1	2	3	Multiplier
Distance to nearest surface water (includes drainage ditches and storm sewers)	Greater than 1 mile	2,001 feet to 1 mile	501 feet to 2,000 feet	0 to 500 feet	8
Net precipitation	Less than -10 in.	-10 to + 5 in.	+5 to +20 in.	Greater than +20 in.	6
Surface erosion	None	Slight	Moderate	Severe	8
Surface permeability	0% to 15% clay ($>10^{-2}$ cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	Greater than 50% clay ($<10^{-6}$ cm/sec)	6
Rainfall intensity based on 1 year 24-hr rainfall	<1.0 inch	1.0-2.0 inches	2.1-3.0 inches	>3.0 inches	8

B-2 POTENTIAL FOR FLOODING

Rating Factor	0	1	2	3	Multiplier
Floodplain	Beyond 100-year floodplain	In 25-year floodplain	In 10-year floodplain	Floods annually	1

B-3 POTENTIAL FOR GROUND-WATER CONTAMINATION

Rating Factor	0	1	2	3	Multiplier
Depth to ground water	Greater than 500 ft	50 to 500 feet	11 to 50 feet	0 to 10 feet	8
Net precipitation	Less than -10 in.	-10 to +5 in.	+5 to +20 in.	Greater than +20 in.	6
Soil permeability	Greater than 50% clay ($>10^{-6}$ cm/sec)	30% to 50% clay (10^{-4} to 10^{-6} cm/sec)	15% to 30% clay (10^{-2} to 10^{-4} cm/sec)	0% to 15% clay ($<10^{-2}$ cm/sec)	8
Subsurface flows	Bottom of site greater than 5 feet above high ground-water level	Bottom of site occasionally submerged	Bottom of site frequently submerged	Bottom of site located below mean ground-water level	8
Direct access to ground water (through faults, fractures, faulty well casings, subsurface features, etc.)	No evidence of risk	Low risk	Moderate risk	High risk	8

TABLE 1 (Continued)

HAZARD ASSESSMENT RATING METHODOLOGY GUIDELINES

IV. WASTE MANAGEMENT PRACTICES CATEGORY

A. This category adjusts the total risk as determined from the receptors, pathways, and waste characteristics categories for waste management practices and engineering controls designed to reduce this risk. The total risk is determined by first averaging the receptors, pathways, and waste characteristics subscores.

B. WASTE MANAGEMENT PRACTICES FACTOR

The following multipliers are then applied to the total risk points (from A):

Waste Management Practice	Multiplier
No containment	1.0
Limited containment	0.95
Fully contained and in full compliance	0.10

Guidelines for fully contained:

Landfills:

- o Clay cap or other impermeable cover
- o Leachate collection system
- o Liners in good condition
- o Adequate monitoring wells

Surface Impoundments:

- o Liners in good condition
- o Sound dikes and adequate freeboard
- o Adequate monitoring wells

Spills:

- o Quick spill cleanup action taken
- o Contaminated soil removed
- o Soil and/or water samples confirm total cleanup of the spill

Fire Protection Training Areas:

- o Concrete surface and berms
- o Oil/water separator for pretreatment of runoff
- o Effluent from oil/water separator to treatment plant

General Note: If data are not available or known to be complete the factor ratings under items I-A through I, III-B-1 or III-B-3, then leave blank for calculation of factor score and maximum possible score.

APPENDIX H

HAZARD ASSESSMENT RATING METHODOLOGY FORMS

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Underground Fuel Spill Site (FS-1)

Location: Southwest boundary of Area A

Date of Operation or Occurrence: March to November 1977

Owner/Operator: LAAFS

Comments/Description: Leak of No. 2 fuel oil from underground tank

Site Rated By: C.D. Hendry

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1-mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			102	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) 3
2. Confidence level (1=confirmed, 2=suspected) 1
3. Hazard rating (1=low, 2=medium, 3=high) 3

Factor Subscore A (from 20 to 100 based on factor score matrix) 100

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B 0.8 x 100 = 80

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore 1 x 80 = 80

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore ______

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	3	8	24	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTALS			46	108
Subscore (100 x factor score subtotal/maximum score subtotal)				43
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
SUBTOTALS			48	114
Subscore (100 x factor score subtotal/maximum score subtotal)				42

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 43

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	80
Pathways	43
TOTAL	180

divided by 3 = 60 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices facto. = final score.

60 x 1 = 60

HAZARD ASSESSMENT RATING METHODOLOGY FORM

Name of Site: Chemical (Pesticide) Disposal Site (DS-1)

Location: Southeast corner of Area A

Date of Operation or Occurrence: 1960-1975

Owner/Operator: LAAFS

Comments/Description: Disposal of pesticide wastewater

Site Rated By: C.D. Hendry

I. RECEPTORS

Rating Factor	Factor Rating (0-3)	Multi-plier	Factor Score	Maximum Possible Score
A. Population within 1,000 feet of site	3	4	12	12
B. Distance to nearest well	3	10	30	30
C. Land use/zoning within 1-mile radius	3	3	9	9
D. Distance to reservation boundary	3	6	18	18
E. Critical environments within 1-mile radius of site	0	10	0	30
F. Water quality of nearest surface water body	1	6	6	18
G. Ground water use of uppermost aquifer	1	9	9	27
H. Population served by surface water supply within 3 miles downstream of site	0	6	0	18
I. Population served by ground water supply within 3 miles of site	3	6	18	18
SUBTOTALS			102	180
Receptors subscore (100 x factor score subtotal/maximum score subtotal)				57

II. WASTE CHARACTERISTICS

A. Select the factor score based on the estimated quantity, the degree of hazard, and the confidence level of the information.

1. Waste quantity (1=small, 2=medium, 3=large) — 2
2. Confidence level (1=confirmed, 2=suspected) — 1
3. Hazard rating (1=low, 2=medium, 3=high) — 3

Factor Subscore A (from 20 to 100 based on factor score matrix) — 80

B. Apply persistence factor:
Factor Subscore A x Persistence Factor = Subscore B — 1.0 x 80 = 80

C. Apply physical state multiplier:
Subscore B x Physical State Multiplier = Waste Characteristics Subscore — 1.0 x 80 = 80

HAZARD ASSESSMENT RATING METHODOLOGY FORM
(Continued, Page 2 of 2)

III. PATHWAYS

A. If there is evidence of migration of hazardous contaminants, assign maximum factor subscore of 100 points for direct evidence or 80 points for indirect evidence. If direct evidence exists, proceed to C. If no evidence or indirect evidence exists, proceed to B.

Subscore _____

B. Rate the migration potential for three potential pathways: surface water migration, flooding, and ground water migration. Select the highest rating and proceed to C.

Rating Factor	Factor Rating (0-3)	Multiplier	Factor Score	Maximum Possible Score
1. Surface water migration				
Distance to nearest surface water	2	8	16	24
Net precipitation	0	6	0	18
Surface erosion	0	8	0	24
Surface permeability	1	6	6	18
Rainfall intensity	2	8	16	24
SUBTOTALS			38	108
Subscore (100 x factor score subtotal/maximum score subtotal)				35
2. Flooding	0	1	0	3
Subscore (100 x factor score/3)				0
3. Ground water migration				
Depth to ground water	2	8	16	24
Net precipitation	0	6	0	18
Soil permeability	2	8	16	24
Subsurface flows	0	8	0	24
Direct access to ground water	2	8	16	24
SUBTOTALS			48	114
Subscore (100 x factor score subtotal/maximum score subtotal)				42

C. Highest pathway subscore

Enter the highest subscore value from A, B-1, B-2, or B-3 above. Pathways Subscore 42

IV. WASTE MANAGEMENT PRACTICES

A. Average the three subscores for receptors, waste characteristics, and pathways.

Receptors	57
Waste Characteristics	80
Pathways	42
TOTAL	179

divided by 3 = 59 Gross total score

B. Apply factor for waste containment from waste management practices. Gross total score x waste management practices factor = final score.

59 x 1 = 59

APPENDIX I

INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES

APPENDIX I
INDEX OF REFERENCES TO POTENTIAL CONTAMINATION SOURCES

Site	Designation	References (Page Numbers)
Underground Fuel Spill Site	FS-1	4, 5, 6, 4-32, 4-33, 4-37, 4-38, 5-1, 5-2, 5-3, 5-4, 5-6, 6-1, 6-2, 6-3, 6-4, 6-7, F-1, H-1, H-2
Chemical (Pesticide) Disposal Site	DS-1	5, 6, 7, 4-34, 4-35, 4-36, 4-37, 4-38, 5-2, 5-6, 6-2, 6-6, 6-7, H-3, H-4

APPENDIX J

WELL LOGS AND WATER-LEVEL ELEVATION DATA

SHEET 1

LOS ANGELES COUNTY
FLOOD CONTROL DISTRICT
Water Conservation Division
WELL DATA

Owner: LOS ANGELES COUNTY FLOOD CONTROL DISTRICT

Location and Description: City of El Segundo; 260' No. of ℄ of El Segundo Blvd; 60' E. of ℄ of Douglas Street; in vault with wells 1318R & 1318S, under manhole cover.

Use: Ground Water Observation

Elev. of average grd. at well: U.S.G.S. Datum

Elev. of grd. adjacent to well: 93.9±' U.S.G.S. Datum

Water surface reference points:

(a) From ___ To ___ Elev. 93.9 How det. District Levels
Description: Hole in top of manhole cover, at grd. surface

(b) From ___ To ___ Elev. ___ How det. ___
Description:

(c) From ___ To ___ Elev. ___ How det. ___
Description:

(d) From ___ To ___ Elev. ___ How det. ___
Description:

Type of well: Std. Mud Rotary Drilled Size 4" - 430'

Original depth: 478' Soundings:

Pumping equipment: None

Power used:

Capacity: Drawdown:

Date drilled: 4-14-69 By Bowline Drilling Co.

Artesian characteristics:

Quality of water:

Remarks: Well 1318Q is isolated from shallower wells 1318R & 1318S, by grout plugs.

(over)

Well Number	
Owner	
Engr. No.	5B 43
D.W.R.	3S/14W-7E? Perm
F.C.	1318Q

LOG OF WELL NO. 1318 Q SHEET 1

FROM	TO	CLASSIFICATION OF MATERIALS	FROM	TO	CLASSIFICATION OF MATERIALS
0	15	Silt, clayey to slightly sandy, orangish-brown.			
15	35	Sand, very fine to very coarse, brown, with abundant black grains.			
35	56	Sand, and gravel: Sand very fine to very coarse, with 20-25% gravel to ½", very well rounded. Gravel decreases to 5% from 48' to 56'.			
56	65	Clay, fat with some silt, yellow-brown.			
65	70	Clay 70% as above, interbedded with very fine sand to 3/8" gravel. Gravel, well rounded, mostly black and red brown.			
70	75	Clay, slightly silty, soft, yellow-brown.			
75	78	Sand, fine to medium, brown, interbedded with 50% clay, silty, soft.			
78	88	Clay, silty, soft, yellow-brown.			
88	95	Clay, as above to 90%. A few thin interbeds of sand, very fine to very coarse, brown.			
95	109	Sand, very fine to coarse, brown to 50%, interbedded with clay, gray and yellow.			
109	135	Sand, fine to very coarse, rare gravel 109-112'; 5%-10% gravel from 112'-115', 10% interbedded clay from 115'-116'. Gravel 5-15% from 116'-135'.			
135	141	Sand, fine to very coarse, brown to gray, rare gravel and 10-20% gray clay stringers.			
141	153	Clay, silty, gray with a small amount of brown wood.			

Perforations 300'- 420'

Con't'd on Sheet 1A

Struck water at

Water level before perf. after perf.

Remarks Gravel Pack 295'-433' ;
Lith. & E logs by L.A.C.F.C.D.

(over)

LOG OF WELL No. 1318 Q SHEET 1A

FROM	TO	CLASSIFICATION OF MATERIALS	FROM	TO	CLASSIFICATION OF MATERIALS
153	159	Sand, very fine to very coarse, gray.			
159	161	Sand, fine to very coarse, with rare gravel, gray.			
161	178	Sand, very fine to very coarse, gray, with 5-10% interbedded gray, silty, clay.			
178	184	Sand, very fine to coarse, gray, rare clay nodules. 5% clay from 181'.			
184	190	Sand, very fine to medium, interbedded with 15% grey silty clay, small amount of brown wood and shells @189'.			
190	217	Silt, very fine to fine sand, clay, wood and shells.			
217	283	Silt & Clay. Clay silty, sticky, gray. Silt probably slightly sandy. Abundant shell fragments and wood from 223'-230'. Abundant shells from 250-253'. Becoming more clayey with depth from 253'.			
283	290	Silt, clayey, gray, with small amount of shells and wood			
290	296	Silt and clay, gray.			
296	300	Sand, very fine to coarse, gray.			
300	305	Sand, very fine to very coarse, gray.			
305	310	Silt, with very fine to medium sand and abundant brown wood. Just a trace of wood from 308-310'.			
310	319	Sand, very fine to medium, gray.			
319	323	Sand, silty, very fine to medium.			
323	327	Silt, clayey, gray.			

CONT'D ON SHEET 1B

Perforations

Struck water at

Water level before perf. after perf.

Remarks

(over)

LOG OF WELL NO. 1318Q SHEET 1B

FROM	TO	CLASSIFICATION OF MATERIALS	FROM	TO	CLASSIFICATION OF MATERIALS
327	329	Sand, silty, fine to medium.			
329	339	Silt, sandy, clayey, small shell fragments.			
339	346	Sand, silty, very fine to coarse.			
346	360	Sand, very fine to coarse, gray.			
360	367	Sand, very fine to very coarse, grey with 10% granules to 1/8" from 359-367'.			
367	374	Sand and gravel well graded from very fine to 1/8".			
374	398	Sand, very fine to medium, gray, with some silty, clay stringers.			
398	429	Sand, fine to very coarse, gray.			
429	439	Sand and silt. Sand very fine to medium with silt.			
439	450	Sand, very fine to coarse, some silt.			
450	478	Clay			
		T.D. 478 on 4-14-69			

Perforations 300'-420'

Silverado Zone

Struck water at

Water level before perf. @ after perf.

Remarks Gravel Packed 295'-433'

Lithologic & "E" logged by LACFCD

(over)

PAGE # 3042

LACFCD LOC. NUMBER	MO-DA-YR	M	WATER SURF. ELEV.	Q	M	REF. POINT TO WS	REF. POINT ELEV.	GRND. SURF. TO WS	GRND. SURF. ELEV.	C
1318 P	11 8 71		-2.2				104.6	106.8	104.6	1
	4 11 72		-2.5					107.1		1
	11 3 72		-1.7					106.3		1
	4 4 73		-2.7					107.3		1
	12 17 73		0.6					104.0		1
	6 20 74		0.7					103.9		1
	1 6 75		1.9					102.7		1
	8 7 75		5.2					99.4		1
	12 18 75		2.9					101.7		1
	5 11 76		2.5					102.1		1
	1 11 77		3.1					101.5		1
	8 10 77		1.8					102.8		1
	1 17 78		1.7					102.9		1
	6 23 78		1.7					102.9		1
	6 27 79		-0.1					104.7		1
	9 23 80		2.4					102.2		1
	4 21 81		2.7					101.9		1
	11 1 83		4.5					100.1		1
1318 Q	9 15 70		-36.1					130.0	93.9	1
	4 26 71		-33.5					127.4		1
	11 8 71		-33.4					127.3		1
	11 8 71		-33.4				93.9	127.3		1
	4 11 72		-34.2					128.1		1
	4 11 72		-34.2				93.9	128.1		1
	11 3 72		-32.4					126.3		1
	11 3 72		-32.4				93.9	126.3		1
	4 11 73		-31.3					125.2		1
	4 11 73		-31.3				93.9	125.2		1
	12 17 73		-26.4					120.3		1
	6 20 74		-27.3					121.2		1
	1 6 75		-27.0					120.9		1
	8 1 75		-29.3					123.2		1
	12 15 75		-28.3					122.2		1
	5 13 76		-28.4					122.3		1
	2 14 77		-24.3					118.2		1
	8 10 77		-28.0					121.9		1
	1 17 78		-25.4					119.3		1
	6 27 78		-28.1					122.0		1
	7 9 79		-22.7					116.6		1
	4 23 81		-6.9					100.8		1
	10 18 83		-22.0					115.9		1
1318 R	9 15 70		-9.2					103.1	93.9	1
	4 26 71		-8.7					102.6		1
	11 8 71		-8.8					102.7		1
	11 8 71		-8.8				93.9	102.7		1
	4 11 72		-9.0					102.9		1
	4 11 72		-9.0				93.9	102.9		1
	11 3 72		-8.2					102.1		1
	11 3 72		-8.2				93.9	102.1		1
	4 11 73		-8.2					102.1		1

APPENDIX K

WATER ANALYSIS DATA

STORET RETRIEVAL DATE 82 2/21

740 3S/14W-..M 1

33 53 39.0 118 21 27.0 2

CCASTAL PLAIN

06037 CALIFORNIA LOS ANGELES

CALIFORNIA 140600

LOS ANGELES

21CALAFD

790721 DEPTH 0

/TYPA/AMBNT/WELL

Southwest Chicago #1

LAWNDALE

PURVEYOR TO AREA A (SO. CAL WATER CO.)

AREA A

LAAFS

SOURCE: USAF CLINIC

	INITIAL DATE			82/06/22
	INITIAL TIME-DEPTH-BOTTOM			1035
00010	WATER	TEMP	CENT	23.3
00011	WATER	TEMP	FAHN	74.0
00095	CNDUCTVY	AT 25C	MICROMHO	576
00403	LAB	PH	SU	7.9
00440	HCO3 ION	HCO3	MG/L	243
00608	NH3+NH4-	N DISS	MG/L	0.640
00615	NO2-N	TOTAL	MG/L	0.010
00620	NO3-N	TOTAL	MG/L	0.730
00680	T ORG C	C	MG/L	0.8
00900	TOT HARD	CACO3	MG/L	168
00916	CALCIUM	CA-TOT	MG/L	52.1
00927	MGNSIUM	MG,TOT	MG/L	9.1
00929	SODIUM	NA,TOT	MG/L	60.00
00937	PTSSIUM	K,TOT	MG/L	6.40
00940	CHLORIDE	TOTAL	MG/L	106
00945	SULFATE	SO4-TOT	MG/L	9
00951	FLUORIDE	F,TOTAL	MG/L	0.20
01022	BORON	B,TOT	UG/L	220
01045	IRON	FE,TOT	UG/L	100 K
01055	MANGNESE	MN	UG/L	50.0 K
70300	RESIDUE	DISS-180 C	MG/L	372
70507	PHOS-T	ORTHO	MG/L P	0.010 K

AREA B LAAFS
SOURCE: USAF CLINIC

-SUPPL [illegible] TO
AREA 6

THE METROPOLITAN WATER DISTRICT OF SOUTHERN CALIFORNIA

TABLE B

ANALYSES OF THE DISTRICT WATER SUPPLIES

CONSTITUENT	SYMBOLS AND UNITS	SOURCE WATER RESERVOIRS				TREATED WATER				
		LAKE MATHEWS GRAB SAMPLE	SILVERWOOD LAKE GRAB SAMPLE	CASTAIC LAKE MONTHLY COMPOSITE	LAKE SKINNER MONTHLY COMPOSITE	WEYMOUTH PLANT MONTHLY COMPOSITE	DIEMER PLANT MONTHLY COMPOSITE	[redacted] PLANT MONTHLY COMPOSITE	SKINNER PLANT MONTHLY COMPOSITE	MILLS PLANT MONTHLY COMPOSITE
		3/5/84	3/5/84	Mar.1984	Mar.1984	Mar.1984	Mar.1984	Mar.1984	Mar.1984	Mar.1984
SILICA	SiO_2 mg/l	7.8	10.6	13.9	7.6	8.9	8.7	13.5	7.8	10.
CALCIUM	Ca mg/l	84	14	38	82	73	75	39	80	14
MAGNESIUM	Mg mg/l	28.0	4.0	14.0	28.5	25.0	26.0	14.0	29.0	4.5
SODIUM	Na mg/l	99	16	38	94	88	89	40	95	18
POTASSIUM	K mg/l	4.3	1.0	2.6	4.3	4.1	4.2	2.6	4.2	1.5
CARBONATE	CO_3 mg/l	1	0	0	4	0	0	0	0	0
BICARBONATE	HCO_3 mg/l	162	65	118	152	146	144	120	157	65
SULFATE	SO_4 mg/l	276	15	86	280	242	253	87	280	20
CHLORIDE	Cl mg/l	83	10	35	80	74	77	37	82	14
NITRATE	NO_3 mg/l	1.10	0.70	1.00	0.35	1.15	1.20	0.95	0.30	0.80
FLUORIDE	F mg/l	0.31	0.15	0.39	0.35	0.35	0.36	0.40	0.36	0.23
BORON	B mg/l	0.08	0.09	0.19	0.10	0.10	0.10	0.19	0.10	0.06
TOTAL DISSOLVED SOLIDS	mg/l	666	104	288	657	590	607	295	657	116
TOTAL HARDNESS-$CaCO_3$	mg/l	325	51	153	322	285	294	155	319	53
TOTAL ALKALINITY-$CaCO_3$	mg/l	135	53	97	131	120	118	98	129	53
FREE CARBON DIOXIDE	CO_2 mg/l	1.2	0.7	1.7	0.9	1.5	1.3	1.4	2.1	0.6
H^+ CONCENTRATION	pH	8.37	8.16	8.07	8.48	8.21	8.25	8.14	8.09	8.26
SPECIFIC CONDUCTANCE	µmho/cm	1036	180	491	1023	932	964	485	1027	199
TURBIDITY	NTU	1.7	1.8	1.5	1.3	0.16	0.13	0.14	0.21	0.12
TEMPERATURE	°C	13	9	12.2	14.5	13.3	13.8	12.2	14.5	10.7
PERCENT STATE PROJECT WATER		0	100	100	0	13	10	100	0	100